



THESIS

**EMERGING TECHNOLOGIES AND THEIR
APPLICATIONS IN THE INDIAN CRIMINAL
JUSTICE SYSTEM WITH SPECIAL REFERENCE TO
DNA PROFILING, NARCO-ANALYSIS AND
POLYGRAPH TEST: AN APPRAISAL
ABSTRACT OF THE
THESIS**

SUBMITTED FOR THE AWARD OF THE DEGREE OF

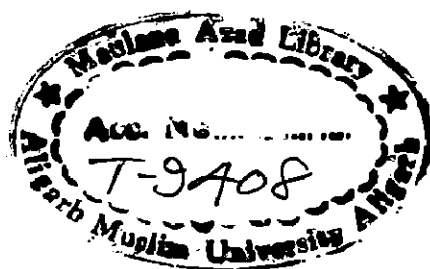
Doctor of Philosophy
IN
LAW

BY
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THESIS

ABSTRACT

1.1 Statement of the Problem

The all round advancement in the field of scientific and technological innovations, socio economic upheaval, population growth, easy access to scientific knowledge, fast communication and better transport facilities have definitely transformed the shape of the society and the modus operandi of the commission of modern day sophisticated crimes. In a country like India, where a considerable chunk of population is still uneducated and the social setup is also heterogeneous, the existence of strained police-public relations, lengthy and complicated procedural wrangles, rampant poverty and mass unemployment, the heavy role of money and muscle power, the eye witnesses often turns hostile, for one reason or the other, thus resulting in the weakening of the prosecution case consequently the benefit of doubt easily goes to the criminals. This has posed a serious challenge to the effective Criminal justice delivery system in the nation. Hence a detailed analysis regarding the nature and scope of these new emerging techniques of forensic science with special reference to DNA testing, Narco-Analysis test, Polygraph test and their admissibility shall be undertaken by the humble researcher during the study.

Crime is inevitable in any society and is as old as the human civilization. Social norms were basically set up for regulating the acts of the people, if they were to live together in the society. The obvious aim was to identify those people who do not follow the set social norms, to punish them and segregate them from the mainstream thus keeping the society free from the menace of criminality. This gave rise to the process of finding out and inquiring the offence and management of illegal affairs, which, in turn, led to the establishment of institutions for the fair investigation as well as for proper prosecution, thereby imparting fair and unbiased justice. Initially, the criminal justice delivery system heavily depended on the testimony of eyewitnesses to the crime. But the sole dependence on "eyewitness" did not prove very effective, as more often than not, they were found to turn hostile, due to the threat of their life or lure of money. Hence it lacked proper consistency and coherency apart from the proper want of relevant testimony which was infact a big hurdle to the justice system. The crime investigators allegedly resorted to the use of "third-degree methods" for interrogation of the suspects in order to bring out the

truth, either by hook or by crook. They were considered inhumans, as many innocent people suffered, both physically and psychologically. In the meantime, lot of scientific researches and developments took place, and it was finally realized that the modern scientific techniques could probably provide quick solutions to a large number of problems of human beings in the process of crime investigation. Thus for the effective investigation of such complicated crimes and bringing the real culprits to book through the criminal process, it became all the more essential to prove that a crime has been definitely committed and also to bring forth adequate evidences in support of the modus operandi through which the crime has been actually been committed and the culprit involved therein. The process of crime detection and gathering the proof with the view to penalize the blameworthy as well as protecting the blameless had been a complex task performed by the law enforcement agencies. With the advent of modern times, when scientific and technological advances started playing a pivotal role practically in all walks of life, the methods of using the knowledge relating to the various science disciplines in crime investigation work also came to be discovered. Over the years, the application of scientific methods in the process of investigation of the crimes has developed into a full fledged field of specialization known as *Forensic Science*. Thus 'Forensic Science' plays an extremely significant role in the investigation of various types of crimes. Forensic Science is not only an essential tool to examine the scene of occurrence and crime exhibition in the Laboratory but it also contributes a significant part in the deposition of the expert's evidence in the courts of Law in our Criminal Justice System. Consequently, Forensic Science is largely related with men, places and time in criminal investigations and trial. The materials which are identified are then compared with the process and final outcome of Forensic Science. Consequently Forensic Science holds by and large all branches of science and applies to law. Originally all the techniques were borrowed from various disciplines, like Physics, Mathematics and Chemistry, but in the past few years it has developed its own branches, which are more or less exclusively the domains of Forensic Science. The science of finger printing, anthropometry, track mark, document (especially the examination of hand writing and the forensic ballistic) essentially belong to forensic science alone.

Therefore it can be said that Forensic Science provides the plausible answers to the following three essential queries in the process of crime investigation.

- When was the crime committed?
- How has the crime been committed?
- Who committed the crime?

A forensic Scientist might be exceptionally good in his field for analyzing/examining the criminal cases, but may be lacking sufficient experience for the effective deposition as an expert witness and to put forth the convincing reasons in order to arrive at the final conclusion in a methodical manner. Therefore, Forensic Science establishes the distinctiveness of the offender through individual clues like fingerprint, footprints, semen, blood drops or hairs etc.

Therefore the responsibility of the forensic chemist/scientist is not only confined to the outputs of his experiment/examination of physical evidences or its related reports, but also to defend himself successfully in the court of law. He is one of the strongest assets of the prosecution who comes forward to tell the real facts on the scientific findings against the criminal without any fear.

Life on the earth is based on cells, almost every cell has a nucleus, and each nucleus carries a complete set of chromosomes. Human beings have 23 pairs of chromosomes which carry linearly arranged genetics unit, which are materially referred as Deoxyribonucleic Acid commonly known as *DNA*. DNA is the genetic material that makes every individual different except for genetically identical twins.

The detection of Deoxyribonucleic Acid or DNA, the decoding of its structure and the deciphering of its heritable information were the revolving points in our understanding of the underlying concepts of inheritance. Now, with the incredible speed as molecular biologists are unraveling the basic structure of genes, we are able to create new products through genetic engineering and develop diagnostic tools and proper treatments for genetic disorders. Till recently these developments were of seemingly peripheral interest to the forensic scientists. All that changed when, in 1985, what progressed out as a more or less usual investigation into the structure of a human gene which led to the discovery of that portion of the DNA structure of certain genes which are as distinctive to each human being as fingerprints. Alec Jeffreys and his colleagues at Leicester University of

England, who were answerable for these revelations, named the process for isolating and reading these DNA markers as “*DNA fingerprinting*.” There later on scientists and researchers unraveled new approaches and differences to the original Jeffreys technique, the term DNA typing has come to be applied to describe this new technology. This finding caught the imagination of the forensic science community, for it has long been the objective of forensic scientists to connect with certainty the origin of crucial biological evidences such as blood, semen, hair, or tissue to a single individual. Even though the conventional testing procedures have gone a long way in narrowing the source of biological materials, individualization remains an elusive goal. Now DNA typing has brought forensic science to the brink of this goal. In the few years since its introduction, *DNA typing* has become an integral part in many public crime laboratories and has been made available to the interested parties through the services of a number of skilled private laboratories. Courts in India have overpoweringly accepted the DNA proof and acknowledged the trustworthiness of its scientific fortification in the United States.

The principles and techniques used for Forensic DNA typing are also quite supportive for many additional purposes. DNA profiles are widely used in resolving the issues of parentage and are rapidly replacing the serologic analysis (i.e. blood typing). In addition, DNA testing is an essential tool for positional cloning, a technique by which a previously unknown gene is recognized, by finding relations or associations connecting DNA markers and the inheritance of a disease.

DNA Testing plays a very significant role in the process of crime investigation in the contemporary era. A great diversity of criminal detection has benefited from DNA testing and it has been especially valuable in solving the sensational cases of rape and murder. Other examples are of robbery, assault, kidnapping, car-accident, extortion, and blackmailing. It has been also successfully applied to the determination of paternity and useful in setting certain immigration disputes that hinge on the family relationships.

In any criminal inquiry, interrogation of the accused plays a vital function in extorting the real truth from them. The agencies investigating the accused are of the view that every crime takes place in a person’s mind before they are conceded out, so by investigating or studying the mind of an accused with or without consent,

would render a great help in the investigation process. With the innovation of science and technology, complicated methods of 'lie detection' have been developed which do away with the use of third degree torture methods by the police. The other scientific methods of interrogation namely *The Polygraph Test*, *The Brain Mapping Test* and *The Narco-Analysis or the Truth Serum Test* are the three major tests that have recently been developed for extracting confessions from the mouth of the alleged suspects. These psychoanalytical tests are also used to interpret the behaviour of the criminal and corroborate the investigating officers' observations. Stephen Horsey introduced the term 'Narco-Analysis' in 1936 which is a combination of hypnosis and narcosis. In this technique, the use of narcotics is made to induce a trance like state wherein the suspected person is subjected to various pertinent queries. The Narco-Analysis test is based on the principle that a person is able to lie using his imagination and under the influence of certain barbiturates, this capability for imagination is blocked or neutralized by leading the person into a semi-conscious state. It becomes difficult for the person to lie and his answers would be restricted to the facts he is aware of. The use of such drug in police investigation or interrogation is similar to the accepted psychiatric view of Narco-Analysis and the only difference in the two procedures is the difference in their objectives.

Since the dawn of civilization, mankind has sought different ways to differentiate the truth from that of the lies in those individuals who are supposed of engaging in unlawful activities. Various imaginative techniques have been tried over the centuries, many of these being outrageous and brutal. Notwithstanding their crudeness, each technique was based on the postulation that some form of physiological effect occurred within a person when confronted with certain stimuli regarding a specific event. This physiological reaction would, in turn, be manifested in certain recognizable symptoms that were indicative of either honesty or deception. There are new technologies that can be used for lie detection. One relates to the facial thermal imaging, a technology that maps facial blood flow. When a person lies, he or she repeatedly becomes apprehensive and extreme blood flows to the areas around the eyes. This blood flow can be easily detected by a thermal imaging screener. Lasers have been developed to identify muscular, circulatory, and other bodily changes assumed to be related with the nervousness of lying. Some computer programs claim

the capability to perceive lies by analyzing the voice and tone of a speaker. According to the inventors, "when a person lies, an unconscious intrusion of the nerves causes the vocal cords to produce an unclear sound wave, specifically a frequency level which is dissimilar from the one produced by the same person while telling the truth/reality". A company has even developed a lie-detecting keyboard, which is claimed to be capable to identify the lies when a person types into a computer by analyzing typing patterns, sensing wetness in fingertips, copy body heat, and monitoring how fast the fingers were moving when they hit the keyboard.

Some of these methods may be more accurate than the modern polygraphs due to the substitution of biased judgment by an examiner with quantitative study by computers. On the other hand, all of these techniques are still based on the postulation that untruthful is connected with definite physiological changes. These technologies were geared towards the identification of the changes in the physiological conditions that might or might not be a direct result of lying.

It can therefore be said that Forensic Science is a science in the service of effective crime detection, Law and Justice, its practice includes scientists of various disciplines, i.e. physicists, biologists, technologist, fire-arm experts, chemists, toxicologists, documents experts, and others. The phenomenon of crime is universal and inevitable and is multiplying enormously with the most sophisticated modus operandi of the criminals in the present era. Hence for the purpose of controlling them, the old techniques are proving quite ineffective, therefore there is a dire need of these new technique to tackle such crimes effectively for the protection of humanity and smooth running of life.

1.2 Objective of the study

In the present study, the role & significance of forensic science with special reference to DNA Testing, Narco-Analysis test and polygraph test in India would be deeply analyzed at length. The study is guided with two major objectives: **Firstly**, how the Forensic Science including DNA test, Narco-Analysis test and Polygraph test are proving to be an effective tool in the process of crime investigation and **Secondly** how the forensic scientists work intimately with the police and investigation officers, members of the legal profession before whom they eventually

appear as an independent expert witness in the process of solving the mystery of the crime and final dispensation of justice.

1.3 Hypothesis

The hypothesis of the present research work have been developed on the following formulations by the researcher-

1. Whether Forensic science has really proved a boon in the criminal investigation?
2. Whether DNA Profiling, Narco-Analysis and Polygraph Tests could be considered as constitutionally valid?
3. Whether the conviction of the accused person could be sustained on the basis of the scientific techniques of Forensic Science?
4. Whether Forensic science has been really helpful in protecting the human rights in the contemporary society?

1.4 Research Methodology

Legal research is a careful, diligent and studious inquiry or examination, especially the investigation or experiment which is aimed at the discovery and interpretation of facts, revision of accepted theories of laws in the light of new facts or practical application of such new or revised theories of laws. Thus, it can be said that research is a vigilant inquiry or an analysis of the principles for unearthing of the new facts or a new interpretation of already existing facts or phenomena.

For the purpose of this work, doctrinal methodology has been adopted. Thus, the study is based upon the vast number of related research and text books, journals, Reports, Case-laws, articles, websites and other relevant materials to the concerned topic which have been collected from certain reputed libraries namely Indian Law Institute, National institute of Criminology and Forensic Science, New Delhi, Maulana Azad Central Library, A.M.U., Aligarh, Law Seminar /Library, A.M.U., Department of Forensic Science at J.N. Medical college, A.M.U., Aligarh. Apart from this, the researcher has also visited a large number of legal sites during course of the study. Throughout the research work a uniform mode of citation has been followed.

1.5 Chapterisation

The entire study has been divided into eight chapters which may be briefly mentioned as follows:

Chapter I sets out the broad framework of the thesis. It provides a general introduction of the subject. Further the researcher has briefly discussed the statement of the problem, objective and hypothesis of the present study followed by the Review of literature along with the research methodology which has been adopted during the study.

Chapter II elaborately ventures into the dynamics of Forensic science in general while highlighting it's nature, scope and significance in the present contemporary society.

Chapter III deals at length with the Conceptual analysis of the subject of forensic science and its utility in the process of crime investigation, thus establishing itself to be an effective aid to the Criminal Justice System.

Chapter IV of the thesis has been dedicated to an elaborate analysis of the modern techniques adopted in forensic science and their applications in the process of Criminal justice system.

Chapter V dwells upon the importance of Narco-Analysis Test in the field of medical science and its significance in legal science, with special reference to its application in the Criminal Justice System.

Chapter VI conceptualizes the relevancy of Polygraph Test in the process of crime investigation. Thus the relevancy of Polygraph test under the Constitutional law, Evidence Act and Criminal Procedure Code has been deeply analyzed at length and duly incorporated.

Chapter VII highlights the role of forensic scientists in the protection of basic human rights of the people.

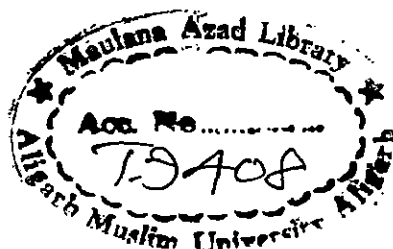
Lastly **Chapter VIII** dealing with 'Conclusion' recaptulates the nodal points of the discussion in the thesis followed by the humble suggestions.

Recommended Suggestions:

- Forensic expert must have thorough scientific knowledge of his /her field. He/she should have requisite knowledge and experience regarding the subject before his/her opinion can be acted upon by the courts.
- The role of forensic expert is very crucial. Any wrong , unreasoned or careless opinion may cause great injustice either to the prosecution or to the accused .This means that forensic expert must possess highly ethical and moral character in performing his/her duties sincerely , carefully and diligently .
- A forensic expert should work independently and without bias or pressure as his/ her ultimate goal is that the real truth and justice must prevail.
- Forensic experts must have also the requisite knowledge of the proper law and should be fully acquainted with the Government regulations and orders which are issued from time to time.
- The opinion and statement of the forensic experts must show, without asking or telling, that he/she is an expert in that particular branch of science and must command due respect on the basis of his/her expertise and opinion.
- Concrete steps should be taken to bring forensic science in the forefront of Criminal justice administration. So the presence of Forensic Lab personnel at the time of collection of DNA evidence from the crime scene should be made mandatory under the law.
- Since there is a possibility of delay in collecting DNA samples from the place of occurrence, submission of the same to the laboratories for test or the samples being often tampered with during transfer, evidence should be shown the way to exclude their possibilities from tampering.
- DNA test may be preferably conducted under the order of the Court.
- A network of standardized Forensic Laboratories should be laid down in the country which should be well equipped and must function with proper documentation authorized by the legislation.
- Adequate provisions should be made to make a National Bank DNA Databank, on the basis of CODES maintained by Federal Bureau

Investigation in USA. Initially to start with the sample of DNA of prisoners should be collected as their finger impressions are taken and the records are maintained by the Government after their conviction under Identification of Prisoner's Act 1920.

- Every officer should be aware of important issues involved in the identification, collection, transportation and storage of DNA evidence. Given the sensitive nature of DNA evidence, the concerned officers should always contact their laboratory personnel or related technicians when the questions relating to the collection of evidence arise.
- Government should train the investigating agencies in a better way so that they can enhance their investigating skills and resort to the Constitutional measures of investigation, rather than adopting an unconstitutional and inhuman measures.
- Intelligence system must be made more sound and efficient.
- Scientific technique of investigation should not be permitted to the extent they became violative of human rights and constitute torture of the accused.
- Rules laid down by the National Human Rights Commission (NHRC) must be strictly followed while using any scientific technique in Narco-Analysis.
- There must be proper legislations for conducting these tests and there must be proper implementation for enforcing these tests.
- More Polygraph Centers should be opened throughout the Country.
- There should be a Centralised body in India for controlling the procedural standard of tests for proper training of examiners as in USA and Japan.
- The polygraph test must be conducted on the accused person with the help of qualified experts only.
- The court must also allow the investigative authorities to conduct these tests without taking the consent of the accused who are involved particularly in the commission of heinous crimes which are extremely dangerous to the integrity and security of the nation.



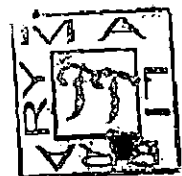


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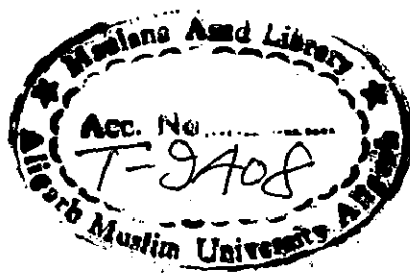
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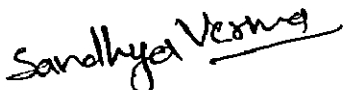


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DECLARATION

It is hereby declared that the present Thesis entitled ***“Emerging Technologies And Their Applications In the Indian Criminal Justice System With Special Reference To DNA Profiling, Narco-Analysis And Polygraph Test: An Appraisal”*** is an original work of undersigned. To the best of my knowledge no earlier work has been done on the same topic in this University or elsewhere.


SANDHYA VERMA
(Research Scholar)

Dr. Mohd. Ashraf
(Professor)




DEPARTMENT OF LAW
ALIGARH MUSLIM UNIVERSITY
ALIGARH, U.P., (INDIA)

Dated:.....

Certificate

It gives me immense pleasure to certify that Sandhya Verma, Research Scholar, Faculty of Law, A.M.U., Aligarh has completed her Ph.D. Thesis entitled *“Emerging Technologies And Their Applications In the Indian Criminal Justice System With Special Reference To DNA Profiling, Narco-Analysis And Polygraph Test: An Appraisal”* under my supervision. The materials incorporated in this Thesis have been collected from various sources. As per her declaration and to the best of my satisfaction the work is an original contribution in the field of law and is suitable for submission for the award of the degree of Doctor of Philosophy in Law.

I wish her all success.


Prof. Mohd. Ashraf
(Supervisor)

LIST OF PUBLICATIONS AND PAPER PRESENTATIONS IN SEMINARS

PUBLICATIONS

1. Mohd. Ashraf and Sandhya Verma, "The Role of Forensic Expert in Protection of Human Rights", *Aligarh Law Journal*, Vol. XXI, 2013-14, pp. 89-101.
2. Mohd. Ashraf and Sandhya Verma, "Protection of Women from Domestic Violence: An Appraisal", *Legal Journal Quest for Justice*, Vol. VI, No. 1, 2013-14, pp. 45-57.
3. Mohd. Ashraf and Sandhya Verma, "Forensic Science in Contemporary Era: Significance and Utility", *Indian Journal of Law Review* (An International Journal of Law), Vol. XX, 2012, pp. 56-66.
4. Mohd. Ashraf and Sandhya Verma, "DNA Profiling: An effective Tool for Crime Investigation", *Souvenir*, Golden Jubilee Celebration, 2011, The Bar Council of Assam, Nagaland, Meghalaya, Manipur, Tripura, Mirozam, Arunachal Pradesh and Sikkim, p. 32-37.

PAPER PRESENTATIONS

1. Paper presented at National Seminar on "Naxalism: Understanding the Issues, Challenges and Alternative Approaches" on "Naxalism in India: An Overview", organized by Department of Defence & Strategic Studies, Shri Varshney College, Aligarh (U.P.) from 30th to 31st March, 2014.
2. Paper presented at International Conference on "Community Participation in HIV/AIDS Prevention, Treatment and Care" on "Transmission of HIV/AIDS: Challenges and Preventive Strategies" organized by R.C.A. Girls' (P.G.) College, Mathura (U.P.) on 02-04 March, 2014.
3. Paper presented at International Seminar on "Postmodernism : Dimensions and Challenges" on "Environmental Protection – A Constitution Mandate" organized by Department of Sanskrit (Interdisciplinary) Faculty of Humanities and Social Science, Shri Varshney College, Aligarh (U.P.) on 01-03 March, 2012.
4. Paper presented at International Seminar on "Prominence of Human Rights in the Criminal Justice System" on "Role of Forensic Expert in Protection of Human Rights" organized by Ambedkar Chair, Department of Contemporary Social Studies & Law, Dr. B.R. Ambedkar University, Agra on 30-31 March, 2012.
5. Paper presented at National seminar on "Gender Equality in India: Renaissance of Socio-Legal Justice" on "Live in Relationship now legal in India – A Critical Analysis" organized by Vivekananda College of Law, Aligarh (U.P.) on 02-03 April, 2011.

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Sandhya Verma

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ABBREVIATION

A	Adenine
ADA	Adenosine Deaminase
AFIS	Automated Fingerprint Identification System
AHRC	Asian Human Rights Commission
AIR	All India Report
Allah.	Allahabad
AP	Andhra Pradesh
ATFB	Bureau of Alcohol, Tobacco, and Firearms
BC	Before Century
BCG	Bar Council of Gujarat
BCI	Bar Council OF India
C	Cytosine
CAPS	Computer Assisted Polygraph System
CAT	Convention against Torture
CBI	Central Bureau of Investigation
CFSL	The central Forensic Science Laboratory
CITIES	Convention on International Trade in Endangered Species
CJM	Chief Judicial Magistrate
CJS	Criminal Justice System
CJS	Criminal Justice System
CMM	Chief Metropolitan Magistrate
CNS	Central Nervous System
CNS	Central Nervous System
CQT	Control Question Technique
Cr.P.C	Criminal Procedure Code
CRC	Convention the Rights of the Child
CriLJ	Criminal Law Journal
CVSA	Computerized Voice Analyzer
DDC	DNA Diagnostics Center
DDT	The Deception Detection Test
DLT	Direct Lie Test
DNA	Deoxyribo Nucleic Acid

EAP	Erythrocyte Acid Phosphates
EDX	Electron Dispersive X-Rays
ESTs	Expressed Sequence Tags
FBI	Federal Bureau of Investigation
FRE	Federal Rules of Evidenced
FSL	Forensic science Laboratory
FTIR	Fourier Transform Infrared Spectrophotometer
G	Guanine
GABA	Gamma Amino Butyric Acid
GC	Gas Chromatography
GKT	Guilty Knowledge Test
GLH	Gujarat Law Herald
GSR	Gun Shot Residue
HLA	Human Leukocyte Antigen
IAFI	Integrated Automated Fingerprint Identification System
IAFIS	Integrated Automated Fingerprint Identification System
IAI	International Association of Identification
IBIS	Integrated Ballistics Identification System
ICC	Indian Journal of Criminology and Criminalistic
ICCPR	International Covenant on Civil and Political Rights
ICESCR	International Covenant on Economic, Social and Cultural Rights
ICJ	Indian Journal of Criminology
ICL	The Journal of Criminal Law &Criminology
ILIJ	Journal of the Indian Law Institute
IPLJ	The Indian Police Journal
KarLJ	Kerala Law Journal
Ker.	Kerala
KLJ	Karnataka law Journal
m RNA	messenger RNA
MDULJ	MDU Law Journal
mtDNA	mitochondrial DNA
NHRC	National Human Rights Commission
NIJ	National Institute of Justice
NLJ	Nual Law Journal

NRC	National Research Council
NRY	Non-Recombining Y-Chromosomes
OTA	Office of the Technology Assessment
PC	Polymerase chain reaction
PDD	Psychological Detection of Deception
POT	Peak of Tension
POTA	Prevention of Terrorism Act
PULJ	Punjab Law University Journal
RAPD	Randomly Amplified Polymorphic DNA
RFLP	Restriction Fragment Length Polymerase
RIT	Relevant/Irrelevant Question Technique
RNA	Ribonucleic Acid
S	Supreme Court
SCC	Supreme Court Cases
SEM	Scanning Electron Microscopy
SNPs	Single Nucleotide Polymorphisms
STR	Short Tandem Repeat
T	Thymine
UDHR	Universal Declaration of Human Rights
UN	United Nations
UNCHR	UN Commission on Human Rights
UNGA	UN General Assembly
VNTR	Variable Number of Tandem Repeat
VNTR	Variable Number Tandem Repeat
WBC	White Blood Cell
WBC	White Blood Cell
ZCT	Zone Comparison Technique

Chapter - I

Introduction

INTRODUCTION

1.1 Statement of the Problem

The advancement in the field of scientific and technological innovation, socio economic upheaval, population growth, easy access to scientific knowledge, fast communication and transport facilities have definitely changed the shape and modus operandi of the modern day sophisticated crimes. In a country like India, where a considerable chunk of population is still uneducated, social setup is heterogeneous, existence of strained police-public relations, lengthy and complicated procedural wrangles, rampant poverty and unemployment, role of money and muscle power, the eye witnesses often turns hostile, for one reason or the other, thus weakening the prosecution case and the benefit of doubt easily goes often to the criminals. This has posed a serious challenge to the effective criminal justice delivery system. Hence a detailed analysis regarding the nature and scope of these new emerging techniques of forensic science with special reference to DNA testing, Narco-Analysis test, Polygraph test and their admissibility shall be undertaken by the humble researcher.

Crime is inevitable in any society and is as old as the human civilization itself. Social norms were basically set up for identifying the acts of the people, if they were to live together. The obvious aim was to identify those people who do not follow the set norms, to punish them and segregate them from the mainstream thus keeping the society free from the menace of criminality. This gave rise to the process of finding out and inquiring the offence and management of illegal affairs, which, in turn, led to the establishment of institutions for the investigation as well as prosecution, thereby imparting fair and unbiased justice. Initially, the criminal justice delivery system heavily depended on the testimony of eyewitnesses to the crime. But the sole dependence on “eyewitness” did not prove very effective, as more often than not, they were found to turn hostile, due to the threat of life or lure of money. Hence it lacked proper consistency and coherency apart from the proper want of relevant testimony which was infact a big hurdle to the justice system. The crime investigators then allegedly resorted to the “third-degree methods” for interrogation of the suspects to bring out the truth, either by hook or by crook. They

were considered inhuman, as many innocent people suffered, both physically and psychologically. In the meantime, lot of scientific researches and developments took place, and it was then realized that the modern scientific techniques could perhaps provide quick solutions to a large number of problems of human beings in the process of crime investigation. Thus for the investigation of such crimes and bringing the culprits to book through the criminal process, it became all the more essential to prove that a crime has been committed and also to bring forth adequate evidences in support of the modus operandi in which the crime has been actually committed and the culprit involved therein. The process of crime detection and gathering the proof with the view to penalize the blameworthy as well as protecting the blameless had been a complex task performed by the law enforcement agencies. With the advent of modern times, when scientific and technological advances started playing a pivotal role in practically all walks of life, the methods of using the knowledge relating to the various science disciplines in crime investigation work also came to be discovered. Over the years, the application of scientific methods in the inquiry of the crime has developed into a full fledged field of specialization known as *Forensic Science*. Hence Forensic Science plays an extremely significant role in the investigation of various types of crimes. Forensic Science is not only an essential tool to examine the scene of occurrence and crime exhibition in the Laboratory but also contributes a significant part in the deposition of the expert evidence in the courts of Law in our Criminal Justice System. Consequently, Forensic Science is largely related with men, places and time in criminal investigations and trial. The materials which are identified are then compared with the process and final outcome of Forensic Science. Consequently Forensic Science holds by and large all branches of science and applies to law. Originally all the techniques were borrowed from various disciplines, like Physics, Mathematics and Chemistry, but in the past few years it has developed its own branches, which are more or less exclusively the domains of Forensic Science. The science of finger printing, anthropometry, track mark, document (especially the examination of hand writing and the forensic ballistic) essentially belong to forensic science alone.

Therefore it can be said that Forensic Science provides the plausible answers to the following three essential queries in the process of crime investigation.

1. When was the crime committed?

2. How has been the crime committed?
3. Who committed the crime?

A forensic Scientist might be exceptionally good in his field for analyzing/examining the criminal cases, but may be lacking sufficient experience for the effective deposition as an expert witness and to put forth the convincing reasons in order to arrive at the final conclusion in a methodical manner. Therefore, Forensic Science establishes the distinctiveness of the offender through individual clues like fingerprint, footprints, semen, blood drops or hairs etc.

Therefore the responsibility of the forensic chemist/scientist is not only confined to the outputs of his experiment/examination of physical evidences or its related reports, but also to defend himself successfully in the court of law. He is one of the strongest assets of the prosecution who comes forward to tell the real facts on the scientific findings against the criminal without any fear.

Life on the earth is based on cells, almost every cell has a nucleus, and each nucleus carries a complete set of chromosomes. Human beings have 23 pairs of chromosomes which carry linearly arranged genetics unit, which are materially referred as Deoxyribonucleic Acid commonly known as *DNA*. DNA is the genetic material that makes every individual different except for genetically identical twins.

The detection of Deoxyribonucleic Acid or DNA, the decoding of its structure and the deciphering of its heritable information were the revolving points in our understanding of the underlying concepts of inheritance. Now, with the incredible speed as molecular biologists are unraveling the basic structure of genes, we are able to create new products through genetic engineering and develop diagnostic tools and proper treatments for genetic disorders. Till recently these developments were of seemingly peripheral interest to the forensic scientists. All that changed when, in 1985, what progressed out as a more or less usual investigation into the structure of a human gene which led to the discovery of that portion of the DNA structure of certain genes which are as distinctive to each human being as fingerprints. Alec Jeffreys and his colleagues at Leicester University of England, who were answerable for these revelations, named the process for isolating and reading these DNA markers as "*DNA fingerprinting*." The later on scientists and researchers unravelled new approaches and differences to the original Jeffreys

technique, the term DNA typing has come to be applied to describe this new technology. This finding caught the imagination of the forensic science community, for it has long been the objective of forensic scientists to connect with certainty the origin of crucial biological evidences such as blood, semen, hair, or tissue to a single individual. Even though the conventional testing procedures have gone a long way in narrowing the source of biological materials, individualization remains an elusive goal. Now DNA typing has brought forensic science to the brink of this goal. In the few years since its introduction, *DNA typing* has become an integral part in many public crime laboratories and has been made available to the interested parties through the services of a number of skilled private laboratories. Courts in India have overpoweringly accepted the DNA proof and acknowledged the trustworthiness of its scientific fortification in the United States.

The principles and techniques used for Forensic DNA typing are also quite supportive for many additional purposes. DNA profiles are widely used in resolving the issues of parentage and are rapidly replacing serologic analysis (i.e. blood typing) for the reason. In addition, DNA testing is an essential tool for positional cloning, a technique by which a previously unknown gene is recognized, by finding relations or associations connecting DNA markers and the inheritance of a disease.

DNA Testing plays a very significant role in the process of crime investigation in the contemporary era. A great diversity of criminal detection has benefited from DNA testing and it has been especially valuable in solving the sensational cases of rapes and murders cases. Other examples are of robbery, assault, kidnapping, car-accident, extortion, and blackmailing. It has been also successfully applied to the determination of paternity and useful in setting certain immigration disputes that hinge on the family relationships.

In any criminal inquiry, interrogation of the accused plays a vital function in extorting the truth from them. The agencies investigating the accused are of the view that every crime takes place in a person's mind before they are conceded out, so by investigating or studying the mind of an accused with or without consent, would render a great help in the investigation process. With the innovation of science and technology, complicated methods of 'lie detection' have been developed which do away with the use of third degree *torture methods* by the

police. The other scientific methods of interrogation namely *The Polygraph Test*, *The Brain Mapping Test* and *The Narco-Analysis or the Truth Serum Test* are the three major tests that have recently been developed for extracting confessions from the mouth of the alleged suspects. These psychoanalytical tests are also used to interpret the behaviour of the criminal and corroborate the investigating officers' observations. Stephen Horsey introduced the term 'Narco-Analysis' in 1936 which is a combination of hypnosis and narcosis. In this technique, the use of narcotics is made to induce a trance like state wherein the suspected person is subjected to various pertinent queries. The Narco-Analysis test is based on the principle that a person is able to lie using his imagination and under the influence of certain barbiturates, this capability for imagination is blocked or neutralized by leading the person into a semi-conscious state. It becomes difficult for the person to lie and his answers would be restricted to the facts he is aware of. The use of such drug in police investigation or interrogation is similar to the accepted psychiatric view of Narco-Analysis and the only difference in the two procedures is the difference in the objectives.

Since the dawn of civilization, mankind has sought different ways to differentiate the truth from that of the lies in those individuals who are supposed of engaging in unlawful activities. Various imaginative techniques have been tried over the centuries, many of these being outrageous and brutal. Notwithstanding their crudeness, each technique was based on the postulation that some form of physiological effect occurred within a person when confronted with certain stimuli regarding a specific event. This physiological reaction would, in turn, be manifested in certain recognizable symptoms that were indicative of either honesty or deception. There are new technologies that can be used for lie detection. One relates to the facial thermal imaging, a technology that maps facial blood flow. When a person lies, he or she repeatedly becomes apprehensive and extreme blood flows to the areas around the eyes. This blood flow can be detected by a thermal imaging screener. Lasers have been developed to identify muscular, circulatory, and other bodily changes assumed to be related with the nervousness of lying. Some computer programs claim the capability to perceive lies by analyzing the voice and tone of a speaker. According to the inventors, "when a person lies, an unconscious intrusion of the nerves causes the vocal cords to produce an unclear sound wave, specifically a frequency level which is

dissimilar from the one produced by the same person while telling the truth/ reality". A company has even developed a lie-detecting keyboard, which is claimed to be capable to identify the lies when a person types into a computer by analyzing typing patterns, sensing wetness in fingertips, copy body heat, and monitoring how fast the fingers were moving when they hit the keyboard.

Some of these methods may be more accurate than the modern polygraphs due to the substitution of biased judgment by an examiner with quantitative study by computers. On the other hand, all of these techniques are still based on the postulation that untruthful is connected with definite physiological changes. These technologies were geared towards the identification of the changes in the physiological conditions that might or might not be a direct result of lying.

It can therefore be said that Forensic Science is a science in the service of effective crime detection, Law and Justice, its practice includes scientists of various disciplines, i.e. physicists, biologists, technologist, fire-arm experts, chemists, toxicologists, documents experts, and others. The phenomenon of crime is universal and inevitable and is multiplying enormously with the most sophisticated modus operandi of the criminals in the present era. Hence for the purpose of controlling them , the old techniques are proving quite ineffective ,therefore there is a dire need of new technique to tackle such crimes effectively for the protection of humanity and smooth running of life.

1.2 Objective of the study

In the present study, the role & significance of forensic science with special reference to DNA Testing, Narco-Analysis test and polygraph test in India would be deeply analyzed at length. The study is guided with two major objectives: **Firstly**, how the Forensic Science including DNA test, Narco-Analysis test and Polygraph test are proving to be an effective tool in the process of crime investigation and **Secondly** how the forensic scientists work intimately with the police and investigation officers, members of the legal profession before whom they eventually appear as an independent expert witness in the process of solving the mystery of the crime and final dispensation of justice.

1.3 Review of Literature

There are various books, research and articles, and reports authored by different eminent scholar which had been very helpful in the completion of the present research work.

Abhijeet Sharma, DNA Test Paternity Determination & Criminal Investigation, ed.2007

In this book, the writer seeks to analyse the importance of DNA profiling in the paternity disputes and the role of DNA profiling in the process of crime investigation has been also explained. At present time, DNA is effective tool in solving the cases relating to paternity dispute, rape, murder, etc. The writer holds that DNA technique which is not only used in numerous areas of research in the modern molecular biology and genetics but also in finding its prospective applications in the day to day life. DNA of each person is unique. DNA can never change during the lifetime of a Person. DNA evidence like fingerprint evidence offers important new tools for the identification and apprehension of some of the most violent perpetrators. At the same time, it also helps of the innocent. It is also used to link the suspect to biological evidence. The writer has also analysed various techniques of DNA Profiling, like RFLP technique, PCR technique, STR technique etc.

B.S. Navras, Forensic Science in Criminal Investigation, 2007

In the present book, the author has aptly explained the significance of forensic science at present era. He has also explained that how forensic science plays a commendable role in solving crime and how it is useful for investigating authorities in order to reach the logical conclusion. Since the methods of committing crimes have been changed, there is dire need to learn the methods of gathering evidence for forensic science investigation authorities. With the help of the scientific evidence a clue can be traced which the criminal leaves behind after committing the crime.

Deepak Ratan & Mohd. H. Zaidi, Forensic Science in India & the World, 2008

In this book, the author's attempt is to bring together the various scientific and legal aspects in the application of forensic science. The writer has discussed about the legal and ethical issues in forensic science for the administration of Criminal Justice. DNA fingerprinting, Brain Mapping, Polygraph test, Cyber technology, Questioned document analysis, Medico-legal analysis, Forensic Ballistic etc has been duely

discussed by the author. Nowadays with the advancement of science and technology, the authors are of the five views that the criminal have also adopted new methods and techniques for committing crimes. Simultaneously science has also helped the investigating authorities in their efforts to nab the criminals. The days of interrogation of criminals by using third degree methods are now giving way to new scientific methods of investigation. The forensic science is one of those modern methods used in identifying crimes and criminals. It is very challenging, charming, dynamics and exciting science.

Dr. B. R. Sharma, Forensic Science in Criminal Investigation & Trial, fourth edition, 2003, reprint in 2011

Forensic science is used to investigate criminal cases, involving a victim, such as assault, robbery, kidnapping, rape, murder and civil cases such as forgeries, fraud, or negligence. According to the author, forensic science is a multi-disciplinary science. Forensic science also determines if laws or regulations were violated in marketing the foods and drinks, proper manufacturing of medicine, agricultural particular use, automobile emission compliance, drinking water purity, and monitoring international secret nuclear weapons programmed. In his book, the author has discussed at length the subject of forensic with special reference to DNA Profiling. He has aptly discussed the intricacies of DNA Profiling which plays a significant role in crime investigation. At the present time the importance of DNA testing is rapidly increasing with the time. With the help of DNA testing, it has really become easy to detect the crime and criminals.

Dr. B.R.Sharma, Scientific Criminal Investigation, 2006

The author of this book has analysed the concept of forensic science in detail. He has clearly showed that how forensic science is an important and effective tool for criminal investigation. According to the author, forensic science is an ornamental and cosmetic utility of the investigation authorities which completes the formalities of legal process and satisfies the lay men. In this book, a serious attempt has been made by author to eliminate personal and professional bias and to delineate objectively the fundamental. This book contains different tools and techniques which are helpful in the field of criminal investigation. In this book, case laws pertaining to voice analysis, fingerprint, DNA Profiling etc has been discussed by the author in a lucid way.

Dr. R.M. Jhala & V.B. Raju, Medical Jurisprudence, Ed. XI, 1997,

The writers of this book while analyzing the different expression like 'Medical Jurisprudence', Legal Medicine and Forensic Medicine say that these terms are usually taken as synonymous but in reality they are meant different, though an interrelated subject. Modi has aptly explained about DNA fingerprinting, legitimacy along with the significance of Medical Jurisprudence in legal science.

James Stuart H., & Nord Jan J., Forensic Science – An introduction to Scientific & Investigative Technique (2003)

Forensic science is a scientific method of gathering and examining the evidence. Crimes are solved with the use of pathological examinations that gather fingerprints, palm prints, footprints, tooth bite prints, blood, and hair and fibre samples. Handwriting and typewriting samples are thoroughly studied, including all ink, paper, and typography. Ballistic techniques are basically used to identify the weapons along with voice identification techniques which are used to identify criminals. In this book, DNA characteristics, origin of DNA Fingerprinting, etc has been discussed in detail & various technologies of DNA has also been analysed.

Justice Abhichandani (judge of Gujarat H.C.) The Gene Age – A Legal Perspective (2003)

In his book, Mr. R.K. Abhichandani has elaborately explained about DNA as the basic of modern genetic science & its importance in the legal system. According to the author, it is the DNA which carries the "blueprint" (genes) from which "building orders" are obtained to direct the growth, maintenance, and activities that go on within our bodies. Except for identical twins, no two people have the same DNA. The importance of first developing DNA testing and its impact on the rights of an individual and societal effect have created an urgent need for getting acquainted with and understanding the basics of modern genetic science for an effective role by all those who are concerned with the justice delivery system. The author has discussed about current advancement in science which provides law enforcement agencies with a supreme opportunity to finally recognize those suspects who have committed the crime. DNA is used with increasing frequency in the criminal justice system to make strength of mind about guilt or innocence. Development of DNA testing has also

provided an authoritative tool to the law enforcement to connect suspect even to very old murders, provided that DNA evidence has been properly preserved.

Jyotirmoy Adhikari, DNA Technology in Administration of Justice, 2007

The modern day biology is seeking new and better ways to enhance our quality of life through the application of technology (Biotechnology) and rapid progress in research on human genome. The recent developing technique of DNA promises a greater degree of accuracy. DNA profiling has been used extensively for paternity testing as well as the criminal investigation. DNA profiling has particular application to the criminal law because of the possibility that it offers a chance of determining whether blood or semen deposits located at the scene of a crime come from a person suspected of having committed the crime. The great importance of the fast developing DNA technology and its impact on the right of an individual and its societal impact have creative and urgent need for getting acquainted with understanding the basics of modern genetic science for playing an effective role by all those who are concerned with justice delivery system. DNA technology plays a pivotal role not only in the identification of offender in criminal cases, but also in paternity dispute cases, baby exchanging cases, in several civil litigations like succession, maintenance, proceedings and matrimonial disputes etc.

DNA Technology is an important technique that allows the scientists to examine genetic material, which can especially be useful to the enforcement agencies in identifying the perpetrator when the crime are committed as all individual have unique pattern in their DNA. The book analyses various factors which has been explained by the writer and he has also discussed about significance of DNA Technology in Criminal Justice System.

Modi's Medical Jurisprudence & Toxicology, Ed.23, 2006

In this book, Modi has given due emphasis on the important of scientific evidence, which is an important branch of jurisprudence is Forensic Science. Forensic Science basically provides scientific study for the investigation of crime. It is a powerful controlling stick (weapon) in the armoury of government of fairness. The expansion, progress and use of Forensic Science in the detection of crime in developed countries is remarkable and growing with the new techniques. The procedure of Forensic Science is nothing but an application of the techniques and methods of basic science

techniques for various analyses of the evidence associated with crimes. In this book it has been also explained by the author that presently forensic science has become an integral branch of science which plays vital role in the process of crime investigation.

Norah Ruddin & Keith Inman, An Introduction of Forensic DNA, 2003

In the present book, the relevancy and importance of DNA testing has been highlighted at length by the author. According to the author of this book DNA plays a very significant role in solving the criminal cases as well as the civil cases.

Deoxyribonucleic acid (DNA) molecules contain the information that all living cells in the human body need to function. They also control the inheritance of characteristics from parents to offspring. With the exception of identical twins, each person's DNA is unique, which makes DNA sampling useful for solving the crimes, identifying the victims of disasters and locating the missing persons. DNA profiling can play a crucial role in solving crimes, as it has the potential to link a series of crimes and/or to place a suspect at the scene of a crime. Nonetheless DNA can also help to prove a suspect's innocence. DNA profiling (also called DNA testing, DNA typing, or genetic fingerprinting) is a technique employed by forensic scientists to assist in the proper identification of individuals by their respective DNA profiles. DNA profiles are the encrypted sets of numbers that reflect a person's DNA makeup, which can also be used as the person's identifier. DNA profiling should not be confused with full genome sequencing. It is used in parental testing and criminal investigation.

Peter Murphy on Evidence, Ed.4th, 2005

The law of the evidence underlies the whole practice of law in every field capable of leading to litigation .Not only a thorough understanding of the rules of admissibility, but also a mature feel for the weight and tactical significance of the evidence should be a part of the foundation of every practice according to the author.

Vinod Nijhawan, Medical Jurisprudence Digest & Basic Principles Ed. 2005

Medical science is on the peak today, with the result that it has invented so many new methods of helping the process of Criminal Law and such inventions gave new life to prosecution department of the World. In this book, the author has analysed the case laws on the subject relating with fingerprint, firearms etc and the basic principles of medical science.

Yawer Qazalbash, Law of Lie Detectors, Narcoanalysis, Polygraphy, Brain mapping, Brain Fingerprinting Ed. 2011

In this book the author has discussed in detail the arguments and scientific facts put forward by both the sides and the real underlying truth. Relevant parts of Forensic Psychology and Conventional methods of interrogation for lie detection have also been included. Narco-Analysis, Polygraphy and Brain-Fingerprinting , generally known as lie detector tests, have recently been under scanner and debate among professionals, scientists, legal-men and the civil society as to the genuineness and reliability of these tests. One faction claims these tests to be fool-proof, while the other considers them as pseudo- science, besides being hazardous to health.

A profile of Forensic Science in juristic journey by Justice Jitendra N. Bhatt (2011)

Forensic Science is an important branch of science. It is a potent and powerful weapon in the armoury of administration of justice. Forensic science provides scientific study for investigation of crimes. The writer seeks to visualize the relationship of forensic science and legal jurisprudence .He has also discussed about the significance of DNA Profiling in Criminal Justice System.

Application of DNA Profiling in administration of criminal justice by Subhodh K. Singh (2011)

In this article, the author has succinctly explained the concept of DNA Profiling with the help of various case laws. He has also given reference of Malimath Committee report and DNA Profiling Bill, 2007. In this article the famous Arushi murder case World Trade Center attack case etc has been discussed by the author in detail with particular reference to DNA Profiling.

Constitutional validity of Narco-Analysis test in Article 20(3) of the Constitution of India by Krupesh V. More (2004)

In this article the author has explained the process and applicability of Narco-Analysis test. His main focus is on the constitutional validity of Narco-Analysis test. He has analysed the concept in the light of the Constitution of India, Indian Evidence Act and Indian Penal Code. The various case laws relating with Narco-analysis test has been analysed.

DNA Methodology and their uses in Forensic Analyses by Suminder K., D.S. Paliwal & V.K.Goyal (2001)

DNA is the most important type of Evidence introduced to forensic science. In this article, the main methodology and their current use in forensic laboratories have been aptly described. Their advantages and disadvantages have also been discussed.

DNA testing and human rights implication in civil cases and in criminal investigation by Dr. A.K. Srivastav, (2007)

The writer has explained in detail the basis of DNA and the application of DNA technology. In this article, judicial approach towards DNA testing and its impact on human rights is also discussed by mentioning representative cases on the related subject.

Exclusion of DNA test under sec 112 of The Evidence Act 1872, A senseless or a meaningful exclusion, (2011)

In present article, the author seeks to explain that how DNA testing is helpful in the determination of paternity of child. Some case laws relating DNA testing have also been discussed by the author.

Expert testimony: The forensic psychologists as expert witness by Subhodh Chandra Singh (2005)

According to the author, the use of expert testimony in the court room has become a common practice. In this article, the writer has explained the significance of forensic expert as witness in Civil cases as well as in Criminal cases.

Evidence through scientific aid by Sahib Singh Chandra (2009)

The present article seeks to explain the significance of evidence in the criminal investigations which has been collected through scientific aid. Some case laws have also been discussed.

History and development of forensic science in India by R.K. Tiwari, K.V. Ravi Kumar (2000)

The writer seeks to explain the relationship of forensic science and jurisprudence. He has also discussed about the significance of DNA profiling in the criminal justice system.

Human rights implication of the Narco-Analysis in criminal justice administration by Jacob Joseph (2011)

This article looks at the subject of Narco-Analysis test. Narco-Analysis is one among the different technology that is increasingly being used by law enforcement authorities in India. The use of Narco-analysis in criminal investigations raises question of law, science, policy and professional ethics. That apart, there is the increasingly challenging problem of the invasion of basic human rights more particularly the right of human dignity and inviolability of human dignity. This article correctly attempts to address the human rights implication of the use of Narco-analysis, more particularly from the perspective of human dignity.

Legal and ethical aspect of genetic engineering and various control mechanism by Dr.R.J.R.Kasibhatla (2011)

The value and significance of DNA technology has been discussed in the field of biotechnology and in legal field by the author of the article.

Legal issue in Forensic DNA by Susan Herrero (2003)

The author has succinctly discussed about significance and admissibility of DNA evidence in the criminal investigation. He has also discussed the model of DNA in the near future i.e. what will be the importance of DNA in future.

Narco-Analysis: A volcano in criminal investigation system by Rattan Singh, (2010)

The revolution in the scientific technology is waiving like fast flowing air and water in the modern world of advancement .The connection of law ,science and technology has thrived to become a significant point for decision of many important issue such as scientific evidence ,genetic and biological research , cloning and privacy of nervous system of person .In the present article, the author has explained the various scientific technique which are helpful in crime detection in solving various civil & criminal cases .

Narco-Analysis and the shifting paradigm of Article 20(3): a comment of Selvi v. State of Karnataka by Anjana Das and Arun Kumar, (2011)

In this article, the writer has analysed the Narco-analysis test with the help of the famous case of Selvi v. State of Karnataka. The aim of this article is to scrutinize

the judgment at two levels: the right against self-incrimination and the right to life and personal liberty. The writer has also given concerning arguments in the favour of the test.

Narco-Analysis –Investigation tool or torture by Punia Rajesh, (2010)

With the advancement of forensic science and technology, major changes have been made in the investigation mechanism and Narco- Analysis test is one of them. In the beginning, Narco- Analysis test were practices on war prisoner and alien. But with the change in society, science and technology it is now practiced more often without consideration the fundamental legal principles on which legal system exists.

Narco-Analysis test –Infringement of individual fundamental rights and its value as evidence by Caesar Roy (2011)

In this article the writer has aptly discussed the definition, procedure of Narco-Analysis test. Constitutional validity of the Narco-Analysis test has been also successfully discussed by the writer.

Narco-Analysis test – Violation of doctrine of self incrimination by Dr. Hari Dutt Sharma (2009)

Narco-Analysis test may be regarded as a scientific tool of investigation and raises doubts regarding the basic human rights and their reliability. Narco-Analysis test can only be conducted when the accused has voluntarily submitted himself for such test but not otherwise laments the author.

Protection of human rights by invoking compensatory jurisdiction by courts by M.S. Deshpande (2014)

Human rights are those rights which are inherent in every human being. In absence thereof human being are not in position to live as human being. In this article the author has explain the concept of human right in detail with the help of provision of Constitution of India. He has also discussed the role of court in protection of human right with the help of case laws.

Scientific tool of interrogation and their constitutional validity by Shiva Kant Dexit (2009)

The modern community requires modern scientific method of crime detection lest the public go unprotected. In this article, those techniques of Lie Detection and their significance has been explained.

The constitutional mandate on the right against self incrimination: A comparative study on the legitimacy of Narco-Analysis by Subhomoy sarkar (2009)

In the present article, the author explains the significance of Narco-Analysis test, position and legality of such tested comparing with the Indian and the US laws.

The science and the crime by som Dutt vasudeva (Cr.L.J.2006)

Many people are not aware that science plays a significant role in the detection of crime and apprehension of the criminal. In its application to the administration of law it is known as “forensic Science”. It is an organized knowledge of the application of the science to explain the scientific problems which appear in the administration of justice. There are various fields relating with forensic science by which help may be taken in the detection of the crime.

The truth about lies: Do lie-detectors work, by Dr.Subhas Chandra Singh (2010)

· This article undertakes a close and critical look at the accuracy of the Lie Detector test.

On the basis of the review of the aforesaid literature the present research work is being carried out in order to appreciate the significance of the emerging techniques in the crime investigations and various scientific techniques like DNA Profiling, Narco-Analysis & Polygraph test.

1.3 Hypothesis

The hypothesis of the present research work is developed on the following formulations by the researcher:

1. Whether Forensic science has really proved a boon in the criminal investigation?
2. Whether DNA Profiling, Narco-Analysis and Polygraph Tests could be considered as constitutionally valid?
3. Whether the conviction of the accused person could be sustained on the basis of the scientific techniques of Forensic Science?
4. Whether Forensic science has been really helpful in protecting the human rights in the contemporary society?

1.4 Research Methodology

Legal research is a careful, diligent and serious inquiry or examination, especially the investigation or experiment which is aimed at the discovery and interpretation of facts, revision of accepted theories of laws in the light of new facts or practical application of such new or revised theories of laws. Thus, research can be said to be a vigilant inquiry or analysis of the principles for unearthing of the new facts or a new interpretation of already existing facts or phenomena.

The present work shall be humbly carried out by the researcher which has goaded the intellectual inquisition in an organized and systematic investigation by employing the methodology of doctrinal research. Precisely, the study is based upon the vast number of related and research and text books, journal, Reports, Case-laws, articles, websites and other relevant materials which would be collected from various reputed libraries namely Indian Law Institute, National institute of Criminology and Forensic Science, New Delhi, Maulana Azad Central Library, A.M.U., Aligarh, Law Seminar /Library, A.M.U., Department of Forensic Science at J.N. Medical college, A.M.U., Aligarh. Apart from this the researcher would also visit a number of legal sites during course the study. Throughout the research work uniform mode of citation will be followed.

1.5 Chapterisation

The entire study shall be divided into eight chapters which may be briefly mentioned as follows:

Chapter I sets out the broad framework of the thesis. It provides a general introduction of the subject. Further the researcher would briefly discuss the statement of the problem, objective and hypothesis of the present study followed by the Review of literature along with the research methodology which would be adopted for the study.

Chapter II elaborately ventures into the dynamics of Forensic science while studying its nature, scope and its significance in the present contemporary society.

Chapter III would deal at length with the Conceptual analysis of the subject of forensic science and its utility in the process of crime investigation, thus establishing itself to be an effective aid to the Criminal Justice System.

Chapter IV of the thesis would be dedicated to an elaborate analysis of the modern techniques adopted in forensic science and their efficacy and application in the process of criminal justice system.

Chapter V would dwell upon the importance of Narco-Analysis Test in the field of medical science and its significance in legal science, with special reference to its application in the Criminal Justice System.

Chapter VI would conceptualize the relevancy of Polygraph Test in the process of crime investigation. Thus the applicability of Polygraph test under the Constitutional law, Evidence Act and Criminal Procedure Code would be deeply analyzed at length.

Chapter VII would highlight the role of forensic scientist in the protection of basic human rights of the people.

Lastly **Chapter VIII** would deal with '**Conclusion**' which would recapitulate the nodal points of the discussion followed by humble suggestions.

Chapter II

Conceptual Analysis of Forensic Science and its Relevancy in Crime Investigation: A Panoramic View

CONCEPTUAL ANALYSIS OF FORENSIC SCIENCE AND ITS RELEVANCY IN CRIME INVESTIGATION: A PANORAMIC VIEW

2.1 Introduction

Crime is as old as civilization itself. The day “homo Sapience” became sophisticated crime was defined. Societal norms were set for identifying the do’s and don’ts for the people, if they were to live together. The clear aim was to recognize the people who do not go behind the lay down norms, penalize them and isolate them from the mainstream and therefore keep the society clean. This gave birth to the processes of discovery and investigation of crime and administration of criminal justice, which in order, led to the establishment of institution for investigation, trial and for imparting impartiality. Originally, the criminal justice delivery system profoundly depended on the testimony of eyewitness to the crime. The dependence on “eyewitness” did not prove to be effective, as they were found to turn hostile, many a time due to threat to life or lure of money, hence it lacked reliability. The crime investigators then resorted to “third degree methods” for examination of the suspect to reveal the truth , which, due to the cultural change and values accepted generally, were considered cruel, as many innocent people also suffered and sometimes inadvertently. In the meantime, lot of scientific research and development took place, and it was then visualized that the modern scientific techniques could provide quick solution to a majority of problem of human being, and therefore, crime investigation of “forensic science” got evolved.¹

2.2 Definitional Aspect:

Forensic science is science used for the purpose of the law and thus any branch of science used in the resolution of legal disputes is forensic science. In the broadest sense, forensic science is any science used in the resolution of legal conflicts. The word “forensic” is rooted in Latin word ‘forensis’.The dictionary meaning of word the “forensic” is “relating to court or law” or “relating to court of law”. But in legal terminology it may mean “the science which deals with the principles and practice of different branches of science which elucidates doubtful questions in court

¹ B.B Nanda and R.K. Tiwari, *Forensic Science in India, A Vision for The Twenty- First Century* (Select Publishers, New Delhi, 2001).

of justice". It is a science composing of those matters which may be considered as common ground to both the scientists and the legal practitioners.² The ancient Roman forum was the site of debate concerning governmental issues, but it also was the courthouse, where trials were held. Therefore, forensic science has come to mean the study and practice of applying natural and physical sciences to the just resolution of social and legal issues. Its use by the legal system distinguishes it from other science; the expectation of routine appearances in a court of law distinguishes a forensic scientist from other scientists. Forensic science subsists coming together with law and science. Even though forensic science has been identified intimately with the criminal justice system in the past, now the forensic scientist plays a gradually more active role in civil proceedings and in regulatory issues. Virtually no limitation exists to the scope of physical evidence that is gist for all forensic scientists. Physical evidence may range in size from the microscopic (for example, a pollen grain) to the macroscopic (for example, a diesel truck). It may be as appalling as the lifeless body of a battered child, as intangible as the brief vapors of gasoline following a suspected arson fire, or as obscure as the composition of dyes in the ink of a contested will.³ This wide meaning covers criminal prosecutions in the widest sense, together with patrons and ecological safeguard and physical condition and protection at work, as well as civil proceeding such as violate of agreement and negligence. On the other hand, in universal practice the term is applied more narrowly to use of science in the in the investigation of crime by the police and by the courts as evidence in resolving the issue in any subsequent trial.⁴ Forensic Science is basically the application of science to law. Forensic science is used to investigate criminal cases involving a victim, such as assault, robbery, kidnapping; rape, murder and civil cases such as forgeries, fraud, or negligence. Forensic science also determines as to whether laws or policies have been dishonored in the marketing of items relating to food and drink, manufacturing of medicine, agricultural particular use, automobile discharge observance, consumption water cleanliness, and monitoring international secret nuclear weapons etc. The first aspect of applied Forensic Science commence with the recognition or individualization might merely be probable after conducting chemical

2 Deepak Ratan and Mohd. H. Zaidi, *Application of Forensic Science in India and World* 28 (Alia Law Agency, Allahabad, edn. 2008).

3 John I. Thornton, "Uses and Abuses of Forensic Science" 69 *American Bar Association Journal* 289(1983).

4 Peter White (ed.), *Crime Scene to Court The Essential of Forensic Science* 1 (RSC Publication, Cambridge, 1998).

or scientific Test. Kinds of evidence that requires testing to ensure correct recognition comprise bloodstains, body fluid, drugs, arson accelerants and other chemicals. The recognition of unidentified material or object may be attained through comparing their characteristics with those of the known standard and established criteria or data base information.⁵ In the Forensic examination of fiber and hairs, determination of fiber type, form, due composition, elucidation of colour, species or anatomical origins utilizes class characteristics for such identification.⁶ The eventual goal of the recognition process in forensic science is individualization, specifically to say that a meticulous piece of evidence originates from a precise locus, scene or person. In reality few type of evidence can be unambiguously individualized like fingerprint and DNA evidence. All other type of evidence can be said to be reliable with originating from a meticulous resource, site or individual, if appropriately identified. Many of the classical database, technique and test now routinely used in the forensic recognition have been created, for some discipline; have taken centuries and for more recent technologies, a few decades. To describe the past growth and development of forensic science, the ongoing discussion would largely deal with the recognized occurrence of the organizational and developmental aspect of numerous discipline as well as specialities within the profession, outlining the profession from basic conception to the application of some methodologies and techniques used today. The progress of the field originates with the universal improvement of a number of different areas of expertise or subspecialty scientific discipline with the rate of exam progress or development of each discipline being tremendously changeable, because of complication, geographical site or availability of financial resource and technology.⁷

2.3 Forensic Sciences and Its Historical Perspectives

Crime in some form or the other has always existed since the beginning of human race. With the advancement in science and technology, the concepts of crime as well as the methods adopted by criminals in its commission has undergone a phenomenal change. On one hand, the intelligent criminal has been quick to exploit science for his criminal acts and on the other hand, the investigator is no longer able

⁵ Forensic Science "Microsoft Encarta Online Encyclopedia 2000, <http://encarta.msn.com> 1997-2000 Microsoft Corporation All.

⁶ Dr. B.R. Sharma, *Forensic Science in Criminal Investigation and Trial* 2(Universal Law Publishing Co., New Delhi).

⁷ *Supra* 2.

to rely on age old art of interrogation and methods to detect crime .Criminalistic is synonym which is used in U.S.A. If one remembers the term 'Eureka', then one would also know where the history of Forensic Science originated. History considers Archimedes (287-212 BC), the man behind the exclamation 'Eureka,' as the father of forensic science. He was exulted when he had found out that a crown was not made of gold, (as it was falsely claimed) by its density and buoyancy. After Archimedes, another early forensic science application was made by Mr. Soleiman, an Arabic merchant of the 7th century. He used fingerprints as a proof of validity between debtors and lenders. In the 700s, the Chinese also used the fingerprint concept. In the 1000s, Quintillion, a prosecutor in the Roman courts, used a similar method to solve murders. The first document that mentions the use of Forensics in the legal matters is the book *Xi Yuan Ji Lu* (translated as "Collected Cases of Injustice Rectified") written in 1248 by the Chinese author Song Ci. Forensic science became quite widespread in the 16th century Europe. Medics began to use their knowledge to investigate the cause of death. Ambrose Paré, a French army surgeon, two Italian surgeons, Fortunato Fidelis and Paolo Zacchia were some of the well known pioneers in this field. Then we have a series of written record like "A Treatise on Forensic Medicine and Public Health" by the French physician Fodéré and "The Complete System of Police Medicine" by the German medic Johann Peter Franck and the first dissertation on systematic document examination published by François Demelle of France. In 1686, Marcello Malpighi, a professor of anatomy at the University of Bologna, identified the fingerprint method. In the 18th century, many scholars did some groundbreaking work in Forensics. Swedish chemist Carl Wilhelm Scheele and German chemist Valentine Ross led the way. England also solved a number of murder cases using forensic science. For instance, in the year 1784 in Lancaster, John Toms was convicted of murder, when a torn bit of a newspaper in a gun was found matching a leftover paper in his pocket. In the 19th century, scholars like Thomas Bewick, an English naturalist, Spanish professor of medicinal/forensic chemistry Mathiew Orfila, John Evangelist Purkinji, professor of anatomy at the University of Breslau, to name a few, made history in forensic science. Eugene François Vidocq is another name in record since he established the first detective force, the Surety of Paris. Arthur Conan Doyle of course cannot be forgotten, who wrote the first Sherlock Holmes case in Bee ton's Christmas Annual of London. By the 20th century, it was the time when we got the Federal Bureau of Investigation (FBI) which launched its Automated Fingerprint

Identification System (AFIS) with the first computerized scans. With the arrival of the computers, there was no looking back. Today there is no crime solving without the help of forensic science. The history of Forensic Science is there to prove its worth.⁸

2.4 Forensic Science Timeline

BCE Fingerprints were found in early paintings and in rock carvings of prehistoric humans. The Chinese used fingerprints to establish identity of documents and clay sculpture, but without any formal classification system. **(700s)** while Quintilian, an attorney in the Roman courts, showed that bloody palm prints were meant to frame a blind man of his mother's murder. **(ca. 1000)**

A Chinese book, Hsi Duan Yu (the washing away of wrongs), contains a description of how to distinguish drowning from strangulation. This was the first recorded application of medical knowledge to the solution of crime. **(1248)**

In Lancaster, England, John Toms was convicted of murder on the basis of the torn edge of wad of newspaper in a pistol matching a remaining piece in his pocket. This was one of the first documented uses of physical matching. **(1784)**

Thomas Bewick, an English naturalist, used engravings of his own fingerprints to identify books he published. **(1800s)**

In 1813 Mathiew Orfila, a Spaniard who became professor of medicinal/forensic chemistry at University of Paris, published *Traite des Poisons Tires des Regnes Mineral, Vegetal et Animal, ou Toxicologie General* 1. Orfila is considered the father of modern toxicology. He also made significant contributions to the development of tests for the presence of blood in a forensic context and is credited as the first to attempt the use of a microscope in the assessment of blood and semen stains.

In 1823 John Evangelist Purkinji, a professor of anatomy at the University of Breslau, Czechoslovakia, published the first paper on the nature of fingerprints and suggested a classification system based on nine major types. However, he failed to recognize their individualizing potential.

In the year 1828 William Nichol invented the polarizing light microscope.

⁸ Yash pal Singh and Mohd. Hasan Zaidi, *Narco-Analysis, Brain Mapping, Hypnosis and Lie Detector Test 2* (Allia Law Agency edn.2000).

In 1830 Adolphe Quetelet, a Belgian statistician, provided the foundation for Brillion's work by stating his belief that no two human bodies were exactly alike.

In 1835, Henry Goddard, one of Scotland Yard's original Bow Street Runners, first used bullet comparison to catch a murderer. His comparison was based on a visible flaw in the bullet which was traced back to a mold.

In 1836 James Marsh, a Scottish chemist, was the first to use toxicology (arsenic detection) in a jury trial.

In 1839 H. Bayard published the first reliable procedures for the microscopic detection of sperm. He also noted the different microscopic characteristics of various different substrate fabrics.

In 1851 Jean Servais Stas, a chemistry professor from Brussels, Belgium, was the first who successfully identified vegetable poisons in body tissue.

Ludwig Teichmann, in Kracow, Poland, developed the first microscopic crystal test for hemoglobin using hemin crystals in 1853

In 1854, An English physician, Maddox, developed dry plate photography, eclipsing M. Daguerre's wet plate on tin method. This made practical the photographing of inmates for prison records.

In 1863 the German scientist Schönbein first discovered the ability of hemoglobin to oxidize hydrogen peroxide making it foam. This resulted in first presumptive test for blood.

Odelbrecht first advocated the use of photography for the identification of criminals and the documentation of evidence and crime scenes in the year 1864 while Thomas Taylor, microscopist to U.S. Department of Agriculture, in the year 1877 suggested that markings of the palms of the hands and the tips of the fingers could be used for the identification in the criminal cases.

Likewise Rudolph Virchow, a German pathologist, was one of the first to both study hair and recognizes its limitations in 1879.

Henry Faulds, a Scottish physician working in Tokyo, published a paper in the journal Nature suggesting that fingerprints at the scene of a crime could identify the offender. In one of the first recorded uses of fingerprints to solve a crime, Faulds used

fingerprints to eliminate an innocent suspect and indicate a perpetrator in a Tokyo burglary in 1880.

In 1891 Hans Gross, examining magistrate and professor of criminal law at the University of Graz, Austria, published *Criminal Investigation*, the first comprehensive description of uses of physical evidence in solving crime. Gross is also sometimes credited with coining the word *criminalistics*. In 1892 Francis Galton published *Fingerprints*, the first comprehensive book on the nature of fingerprints and their use in solving crime. Alfred Dreyfus of France was convicted of treason based on mistaken handwriting identification by Bertillon in 1894.

Sir Edward Richard Henry developed the print classification system that would come to be used in Europe and North America. He published *Classification and Uses of Finger Prints* in 1896. In 1898 Paul Jesrich, a forensic chemist working in Berlin, Germany, took photomicrographs of two bullets to compare, and subsequently individualize, the minutiae.

In 1900, Karl Landsteiner first discovered human blood groups and was awarded the Nobel Prize for his work in 1930. Max Richter adapted the technique to type stains. This is one of the first instances of performing validation experiments specifically to adapt a method for forensic science. Landsteiner's continued work on the detection of blood, its species, and its type formed the basis of practically all subsequent work.

Sir Edward Richard Henry was appointed head of Scotland Yard and forced the adoption of fingerprint identification to replace anthropometry in 1901. In 1903, the New York State Prison system began the first systematic use of fingerprints in United States for criminal identification. While Oskar and Rudolf Adler developed a presumptive test for blood based on benzidine, a new chemical developed by Merk in 1904.

In 1905 American President Theodore Roosevelt established Federal Bureau of Investigation (FBI). Victor Balthazard, professor of forensic medicine at the Sorbonne, with Marcelle Lambert, published the first comprehensive hair study, *Le poil de l'homme et des animaux*. In one of the first cases involving hairs, Rosella Rousseau was convinced to confess to murder of Germaine Bichon. Balthazard also

used photographic enlargements of bullets and cartridge cases to determining weapon type and was among the first to attempt to individualize a bullet to a weapon in 1910.

Masao Takayama developed another microscopic crystal test for hemoglobin using hemochromogen crystals in 1912. While in 1913, Victor Balthazard, professor of forensic medicine at the Sorbonne, published the first article on individualizing bullet markings.

In 1915, Leone Lattes, professor at the Institute of Forensic Medicine in Turin Italy, developed the first antibody test for ABO blood groups. He first used the test in casework to resolve a marital dispute. He published *L'Individualità del sangue nella biologia, nella clinica, nella medicina, legale*, the first book dealing not only with clinical issues, but heritability, paternity, and typing of dried stains.

In 1915, International Association for Criminal Identification, (to become The International Association of Identification (IAI), was also organized in Oakland, California.

In 1918, Edmond Locard first suggested 12 matching points as positive fingerprint identification. Georg Popp pioneered the use of botanical identification in forensic work in 1920. John Larson and Leonard Keeler designed the portable polygraph in 1921

In 1923, Vittorio Siracusa, working at the Institute of Legal Medicine of the R. University of Messina, Italy, developed the absorbtion-elution test for ABO blood typing of stains. Along with his mentor, Lattes also performed significant work on the absorbtion-inhibition technique.

August Vollmer, as chief of police in Los Angeles, California, implemented the first U.S. police crime laboratory in 1924.

Saburo Sirai, a Japanese scientist, is credited with the first recognition of secretion of group-specific antigens into body fluids other than blood in 1925.

Landsteiner and Levine first detected the M, N, and P blood factors leading to development of the MNSs and P typing systems in 1927.

Yosida, K. I. a Japanese scientist, conducted the first comprehensive investigation establishing the existence of serological isoantibodies in body fluids other than blood in 1929. Calvin Goddard's work on the St. Valentine's Day massacre

led to the founding of the Scientific Crime Detection Laboratory on the campus of Northwestern University, Evanston, Illinois in 1929.

In 1930, American Journal of Police Science was founded and published by staff of Goddard's Scientific Crime Detection Laboratory in Chicago. In 1932, it was absorbed by Journal of Criminal Law and Criminology, becoming the Journal of Criminal Law, Criminology and police science.

In 1931, Franz Josef Holzer, an Austrian scientist, working at the Institute for Forensic Medicine of the University of Innsbruck, developed the absorption-inhibition ABO typing technique that became the basis of that commonly used in forensic laboratories. It was based on the prior work of Siracusa and Lattes.

The Federal Bureau of Investigation (FBI) crime laboratory was created in 1932. While M. Polonovski and M. Jayle first identified haptoglobin in 1938.

Landsteiner and A.S. Wiener first described the concept of Rh blood groups in 1940.

While in 1941 Murray Hill of Bell Labs initiated the study voiceprint identification. The technique was refined by L.G. Kersta.

In 1945, Frank Lundquist, working at the Legal Medicine Unit at the University of Copenhagen, developed the acid phosphates test for semen. While Mourant first described the Lewis blood group system in 1946.

M. Cutbush, and colleagues first described the Duffy blood group system in 1950.

F. H. Allen and colleagues first described the Kidd blood grouping system in 1951.

Kirk published Crime Investigation, one of the first comprehensive criminalistics and crime investigation texts that encompassed theory in addition to practice in 1953.

A. S. Weiner and colleagues introduced the use of H-lectin to determine positively O blood type in 1958.

Hirshfeld first identified the polymorphic nature of group specific component (GC) in 1959.

Lucas, in Canada, described the application of gas chromatography (GC) to the identification of petroleum products in the forensic laboratory and discussed potential limitations in the brand identity of gasoline in 1960.

D.A. Hopkinson and colleagues first identified the polymorphic nature of erythrocyte acid phosphates (EAP) in 1963.

Culliford, of the British Metropolitan Police Laboratory, initiated the development of gel-based methods to test for isoenzymes in dried bloodstains. He was also instrumental in the development and dissemination of methods for testing proteins and isoenzymes in both blood and other body fluids and secretions in 1967.

Spencer and colleagues first identified the polymorphic nature of red cell adenosine deaminase (ADA) in 1968.

Culliford published *The Examination and Typing of Bloodstains in the Crime Laboratory*, generally accepted as responsible for disseminating reliable protocols for the typing of polymorphic protein and enzyme markers to the United States and worldwide in 1971.

In 1974, the detection of Gun Shot Residue (GSR) using scanning electron microscopy with electron dispersive X-rays (SEM-EDX) technology was developed by J. E. Wessel, P. F. Jones, Q. Y. Kwan, R. S. Nesbitt and E. J. Rattin at Aerospace Corporation.

In 1976, Zoro and Hadley in the United Kingdom first evaluated GC-MS for forensic purposes. While in 1977, Fuseo Matsumur, a trace evidence examiner at the Saga Prefectural Crime Laboratory of the National Police Agency of Japan, notices his own fingerprints developing on microscope slides while mounting hairs from a taxi driver murder case. He relates the information to co-worker Masato Soba, a latent print examiner. Soba would later that year be the first to develop latent prints intentionally by "Superglue(r)" fuming.

The fourier transform infrared spectrophotometer (FTIR) is adapted for use in the forensic laboratory in 1977.

Alec Jeffreys developed the first DNA profiling test. It involved detection of a multilocus RFLP pattern. He published his findings in *Nature* in 1985 in 1984.

In 1986, in the first use of DNA to solve a crime, Jeffreys used DNA profiling to identify Colin Pitchfork as the murderer of two young girls in the English Midlands. Significantly, in the course of the investigation, DNA was first used to exonerate an innocent suspect.

DNA profiling was introduced for the first time in a U.S. criminal court. Based on RFLP analysis performed by Lifecodes, Tommy Lee Andrews was convicted of a series of sexual assaults in Orlando, Florida in 1987.

K. Kasai and colleagues published the first paper suggesting the D1S80 locus (pMCT118) for forensic DNA analysis. D1S80 was subsequently developed by Cetus (subsequently Roche Molecular Systems) corporation as a commercially available forensic DNA typing system in 1990.

Walsh Automation Inc., in Montreal, launched development of an automated imaging system called the Integrated Ballistics Identification System, or IBIS, for comparison of the marks left on fired bullets, cartridge cases, and shell casings. This system was subsequently developed for the U.S. market in collaboration with the Bureau of Alcohol, Tobacco, and Firearms (ATF) in 1991.

In response to concerns about the practice of forensic DNA analysis and interpretation of the results, the National Research Council Committee on Forensic DNA (NRC I) published DNA Technology in Forensic Science in 1992.

In *Daubert et al. v. Merrell Dow*, a U.S. federal court relaxed the Frye standard for admission of scientific evidence and conferred on the judge a “gatekeeping” role. The ruling cited Karl Popper’s views that scientific theories are falsifiable as a criterion for whether something is “scientific knowledge” and should be admissible in 1993.

Roche Molecular Systems (formerly Cetus) released a set of five additional DNA markers (“polymarker”) to add to the HLA-DQA1 forensic DNA typing system in 1994.

In response to continued concerns about the statistical interpretation of forensic DNA evidence, a second National Research Council Committee on Forensic DNA (NRC II) was convened and published *The Evaluation of Forensic DNA Evidence* in 1996.

An FBI DNA database, NIDIS, enabling interstate cooperation in linking crimes, was put into practice in 1998.

The FBI upgraded its computerized fingerprint database and implemented the Integrated Automated Fingerprint Identification System (IAFIS), allowing paperless

submission, storage, and search capabilities directly to the national database maintained at the FBI in 1999.⁹

2.5 Relevance of Forensic Science: An Appraisal

In the criminal investigation there is a pressing and awful requirement for the application of forensic science. The current picture of crime investigation of criminals is a depressing story. A big percentage of the murder trials, lastly, end in acquittals. It is expected that the prosecution agency spends on an average over Rs. 10,000.00 per trial. Therefore, not only a hazardous criminal goes scot free but vast amount of public currency is also wasted. These recurrent acquittals also make confident the criminals.¹⁰ In India investigation of crime and prosecution of persons having committed the crime are not up to the mark. Even in dreadful crimes large number of criminals could not be prosecuted and a few percentages of trials end in acquittal accordingly of which numbers of criminals as well as crimes are rising gradually. These recurrent acquittals are mainly because of outdated techniques of investigation which depart various loopholes. Thus for effective investigation scientific ways of investigation is very necessary.¹¹ The need for the application of science in criminal investigation has arisen from the following factors:

2.5.1 Social change

The society is enormously changing with the changing of the time with the changing of the time with great speed. India has developed from colonial rules to the democratic republic. Sizeable industrial complex has multiplied. With the passage of the time the transport facilities have also revolutionized. There is huge exodus of people from the rural to the urban cities due to vast industrialization search for suitable employment and better livelihood. Due to these drastic changes the old methods of crime investigation have become totally redundant in the presence of the new modern techniques of forensic science. During the British regime the role of police was quite fearful. Often it was apprehended that the police would resort to the degree torturous methods on the suspect ones making them confess under huge

⁹ "Forensic Science Timeline", available at: www.yahoo.com (visited on date 12-06-2010).

¹⁰ B.R. Sharma, *Forensic Science in Criminal Investigation and Trial* 7 (Universal Law Publishing Co., New Delhi, 2011).

¹¹ *Supra* 7, 26.

pressure or creating undue fear in the mind of the suspect. Thus, their basic purpose was to extract confession either by hook or by crook methods.¹²

2.5.2 Hiding facilities

At present, the quick means of transport and overcrowding of population in cities the commission of the offence has becomes quite easy. The offender can hide himself in a corner of a city or move away to thousands of miles in a few hours. Therefore, he escapes from one place to another from apprehension and prosecution.¹³

2.5.3 Technical knowledge

The technological knowledge and awareness of an average man has increased tremendously in modern era. The methods of committing crimes are getting modernize day by day. So there is dire need for the development of new scientific techniques for investigating officer in order to combat the modern day criminals.¹⁴

2.5.4 Wide field

The area of criminal's activities is increasing day by day at terrific rate. In the earlier time mostly the criminals wee local in the country, but with the huge multiplication of modern society, both national and international criminal have entered in to the arena of the crime. Some of the expanding areas are financial frauds, Smuggling, Drug trafficking and fake proposal.¹⁵

2.5.5 Better evidence

Normally the physical evidence judged by an expert is quite objective in nature, where if a fingerprint is found at the scene of crime, it is viewed to be only one person. If that person happens to be the suspect, he must account for his presence at the scene. Similarly that if a bullet is recovered from a dead body, it can be attributed to only one firearm. If this firearm happens to be that of the accused, he must be accountable for its involvement in the crime. Such evidence is always verifiable.¹⁶

2.6 Scope of Forensic Science

At the present time, because of scientific and technical growth the value of forensic science is increasing with time. Forensic Science has its wide scope. It is

¹² *Supra* 10, 8.

¹³ *Ibid.*

¹⁴ *Ibid.*

¹⁵ *Id* .

¹⁶ *Ibid.*

used to examine the criminal cases connecting the victim, for instance assault, robbery, kidnapping rape, murder and civil cases for example forgeries, fraud or negligence. Forensic Science decides as well whether laws or regulation were violated in marketing food and drink, manufacturing of medicine, agricultural pesticide use, automobile emission compliance, drinking water purity and monitoring international secret nuclear weapon program. It also deals with forensic medicine and toxicology, DNA profiling, personal identification, fingerprint, ballistic and firearm identification, soil examination, identification and association of human hair, blood, serum, hair, saliva etc.¹⁷

There are various fields relating with forensic science like as Criminalistics, Engineering Sciences, General, Jurisprudence, Odontology, Pathology/Biology, Physical Anthropology, Psychiatry & Behavioural Science, Questioned Documents, and Toxicology.

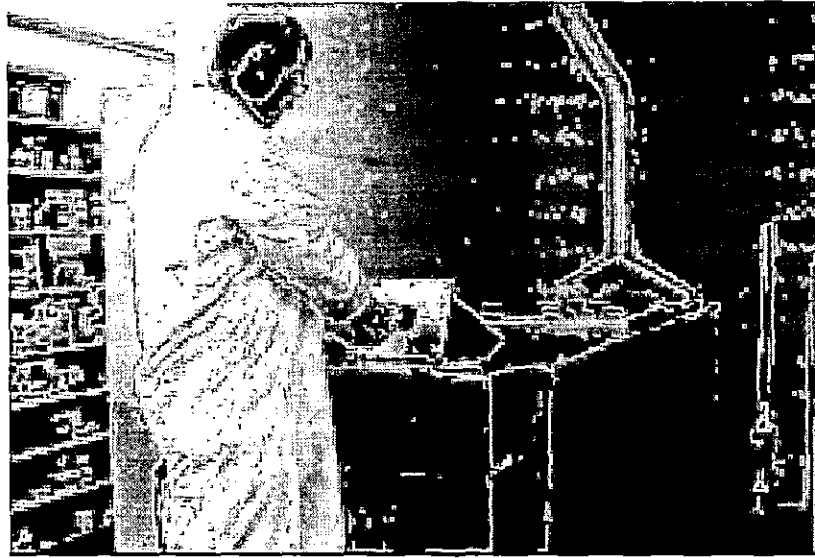
2.6.1 Criminalistics

Criminalistic is the science dealing with the recognition, correction, identification, individualization, and interpretation of physical evidence and the application of natural sciences to law science matter. The term was commence from the book 'Handbuch fur Untersuchungsrichter ales System der Kriminalististik' (3rd Ed.) by Hans Gross, who was an investigating magistrate and professor of Criminology at the University of Prague. The citation of Mr. Paul L. Kirk¹⁸ is important in pointing out, which is as follows: "Wherever he steps, whatever he touches, whatever he leaves, even without thinking, will serve as silent evidence against him. Not only his fingerprints or his footprints, but his hair, the fibers from his clothes, the glass he breaks, the tool mark he leaves, the paint he scratches, the blood or semen that he deposits or collects - all these bear mute testimony against him. This is evidence that does not recall. It is not confused by the stimulation of the moment. It is not absent because human witnesses are rather is a factual evidence. Physical evidence cannot be wrong it cannot perjure itself; it cannot be wholly absent. Only its explanation can make a mistake. Only human failure to find it, study and understand it can diminish its value."¹⁹

17 "Forensic Science Timeline", *available at*: www.forensicscience.com (visited on date 21-11-2010).

18 Popularly known as the Father of Criminalistic.

19 "Forensic Science", *available at*: <http://www.criminalistic.com> (visited on date 14-10-2010).



Test Firing of a Weapon in the Firearms Section of a Forensic Lab

The regulation of Criminalistic include all areas of trace evidences, for instance soil, glass, hairs, fibers, blood, and other body fluid, including, saliva, sweat, semen and vitreous humor. Criminalistic moreover contain arson, explosive, drug recognition and examination, understanding of outline and imprint evidence, and is definitely the largest of the discipline of forensic science.²⁰ Criminalists examine, evaluate, recognize, and understand physical evidences. There are two main functions of forensic labs: 1) recognizing evidence, and 2) connecting the suspect, injured party, and crime scene throughout physical evidences. The major function of the criminalist is to independently relate the techniques of the physical and usual sciences to observe physical evidence. Physical evidence may be something: evidence so little that a microscope is considered necessary to observe it, or as big as a truck. It might be as subtle as a smell of a inflammable gas at an arson scene or as apparent as a pool of blood at a slaughter sight. The vast collection of material challenges the inventiveness of the criminalist who examines and identifies hair, fibers, blood, seminal and body fluid stains, alcohol, drugs, smear, glass, botanicals, soil, flammables, and safe insulating material, restores smeared or smudged markings, and identifies firearms and compares bullets, tool markings, and foot prints. In most cases, the amount of the evidence to be tested is very small, such as a drop of blood, a hair, or a piece of glass.

The criminalist separates significant evidence from that having little or no value by means of investigative ability and realistic practice. Subsequently, the

²⁰ Jay A. Stegel, Pekka J. Saukko, and Geoffer C Knupyr (ed.), *Encyclopedia of Forensic Science* 1072 (Academic Press, 2000).

criminalists arrange, evaluate, and recognize the proof by using chemicals and instruments expand useful information for trial or an examination. It may be finding by the Criminalistic that a bullet has been fired from a particular gun, the blood in the suspect's car is from the injured party, or that a piece of plastic from the scene of a hit-and-run accident has broken off a particular car. These types of examination are complicated; they need an eye for detail, large realistic scientific surroundings, and the capability to relate these skills in the laboratory.²¹

Wildlife forensics is one of the most recent areas of criminalists. Poaching infringements, the expansion of state and federal pursuing regulations, the Endangered Species Act of 1973 and the United National Convention on International Trade in Endangered Species (CITIES) are some of the aspect which helped generates this innovative field. The major difference between criminal forensic science and wildlife forensic science is that in the wildlife forensic the sufferer (and rarely the suspect) is an animal. The recognition of wildlife evidence, on the other hand, can be more difficult in comparison of human science in that wildlife enforcement officers hardly ever confiscate total animals, which can be eagerly recognized by a museum or zoo expert. They will further characteristically seize parts and products of these animals as proof. The difficulty at that time is that the uniqueness which identifies an animal species is hardly ever present in those parts.²²



Photo Courtesy - Wildlife Park and Ranch, Bismarck, Montana (for CITES)

Pelts and Skins from Dying Out Animals

²¹ *Supra* 10.

²² *Id.*

Government of India has enacted laws to protect wild life from poaching. Violation of these laws is not uncommon. Forensic science laboratories are required to create facilities for investigation of wild life crime. Infrastructure facilities for raising the “anti-ceras” may be upgraded²³ by major FSLs in the country. With the new legislation on patents and creation of gene banks, forensic science laboratories have to face new challenges involving scientific examination of species of plants etc. It is imperative for the forensic science laboratories to create infrastructure facilities for this type of crime investigation.²⁴ Wildlife forensic scientists are frequently required to expand recent ways to recognize class throughout study with carefully documented known specimens before they can examine evidence in a case and testify in court. An extra difficulty is that, at the same time as human forensics deals with only a single species (*Homo sapiens*), wildlife forensic scientists must be ready to recognized evidence from any species in the world that is unlawfully killed, smuggled, poached or sold on an illicit market. There are various examples of wildlife evidence items. It might be blood on an unlawful hunter's clothing, fresh, freezing or smoked meats, loose hair, fur coats, reptile leather products, for example purses, shoes and belts, loose feathers and down, carved ivory objects, sea turtle oil (suntan lotion), shell jewelry, and powdered rhinoceros horn.²⁵



Banned Objects Prepared from Ivory

²³ *Supra* 1, 215.

²⁴ *Id.*, 216.

²⁵ *Supra* 12.

2.6.2 Engineering Sciences

Forensic engineering is a comparatively novel discipline; forensic engineers commonly are called on to assist with the modernization of automobile accidents, to assess evidence in product liability cases, and to conduct failure analyses on a wide variety of manufactured items. Innovations and problem-solving are explaining behavior of an engineer.²⁶ The principles of mathematics and science are applied by an engineer for various purposes. The art and science of engineering is applied by the forensic engineer to the purpose of the law. A good number desire for services involve civil suits. On the other hand, the forensic engineer might also support in the prosecution or defense of unlawful or regulatory matters.

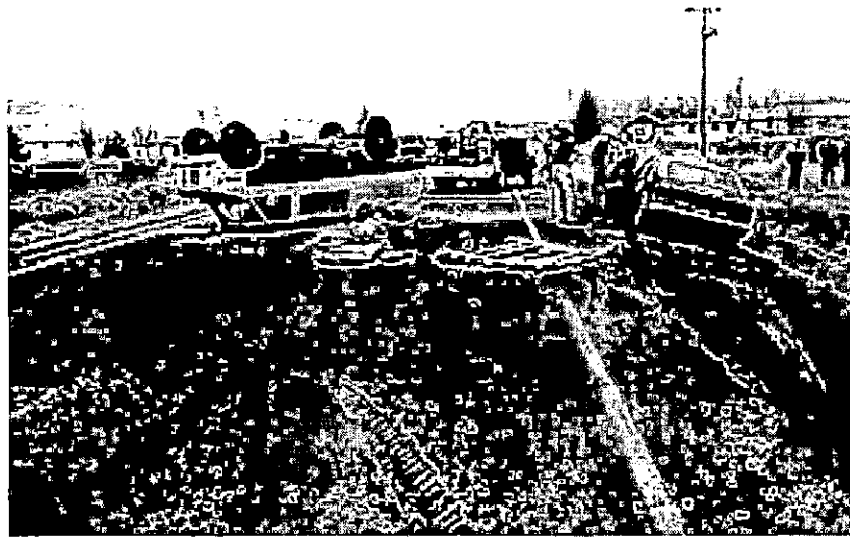
Questions produce to forensic engineers are in subjects as diverse as the specialties of the engineers themselves. Distinctive subjects consist of: plan analysis, excellence assessment of creation or manufacturing, safeguarding measures, failure examination, accident renovation, reasons and beginning of fires or explosions, and environment definition. The extents might vary from whole communiqué networks or shipping systems to the molecular composition or granule structure of a specific component. Structures examined may vary from skyscrapers, aircraft, or bridges to surgical implants or bones. Conclusions are applied in personal injury litigation, construction claims, contract or warranty disputes, patent or copyright infringements, criminal, and regulatory matters.

A few pertinent questions may be asked by the engineer to answer are as follows:

- Why did the vehicle roll over?
- How could the mishap have happened?
- Why did the airoplane collide?
- Why did the building collapse?
- Did defects exist? ²⁷

²⁶ *Supra* 2, 290.

²⁷ "Scope of Forensic Engineering in the field of Forensic Science", available at: <http://www.ifes.org/>. (Visited on date 21-03-2011).



Forensic Engineers On-Site Investigating An Accident

In most of the lawful disputes involving engineering issues, every party will appoint its own engineer for discussion and to verify on its behalf. In further words, the forensic engineers work is matter to the inspection of other extremely qualified professional.

2.6.3 General Section

"There is literally no end to the number of disciplines that become 'forensic' by definition. Nor is there an end in sight to the number of present or future specialities that may become forensic".²⁸

The General Section is the domicile of recently escalating forensic scientific area of expertise and for those established areas of forensic science not appropriate the more narrow definitions or membership requirements of the other sections, or those forensic specialists whose numbers are not adequate to uphold a divide section.²⁹ Members of the General Section contain scientists who have forensic specialties in the scientific areas of laboratory examination, field examination, scientific work, communiqué, processor examination, learning, explore, and other up-and-coming forensic science disciplines. These scientists are employed or practicing in the following areas of forensic activity: bureaucrat, accountant, archaeologist, artiste/sculptor (including facial renewal), aviation mishap researcher, ballistics psychoanalyst (bullets recital and injury understanding), processor connected crime

²⁸ *Supra* 9.

²⁹ Anthony Longhetti BA Past President, AAFS Editional, Journal of Forensic science, 1983:28:3-3.

researcher, processor expert, forensic advisor, coroner (non-pathologist), crime scene examiner, medico-legal researcher, teacher (potentially every forensic regions), picture improvement expert, maritime ecologist, nurse inspector, photographer, polygraph inspector, radiologist, investigator, rehabilitation specialist, social worker - forensic applications, and speech scientist (voice recognition, improvement of recordings, legalization as well as verification of transcriptions and/or recordings).



Forensic Skull Reconstructionist Sculpting Person's Skull to Portray A Close Formation of the Look of the Person for Recognition Reasons

Innovative regions of forensic crime consequence from a mixture of distinctive trouble faced by examiners and advancement in natural and social sciences. A lot of the entrenched disciplines in the forensic sciences were nurtured in and came out from the General Section of the American Academy of Forensic Sciences.³⁰ The beginning of digital photography with its possibility to aid in the certification of crime scenes and damages, as well as to speed up all aspects of photography from mug shots to autopsy, creates an important area of research and development. Such photographs present many dangers and the weight of simple modification ought to be balanced with the benefits of pace and economy. These issues extend to the computer imaging of crime scenes, suspect composites, and victim characteristics for possible

³⁰ "Scope of forensic science", available at: <http://www.aafs.org> (visited on date 23-11-2011).

identification. The trustworthiness and scientific correctness of processor recreations of felony panorama proceedings as well remainder an area for much-needed research.

Tape recordings and digital voice recognition etiquette, audio as well as verbal communication examinations persist to be a growing region of study and appliance. By capabilities to disguise voices by off-the-shelf machinery, the examination of fundamental aural pattern has turn into one of a lot of significant areas of both technological and linguistic research.

Environmental consciousness fetches the inquiry of felony connecting to the diverse facet of dangerous squander, unlawful discarding, as well as further such offense in opposition to the surroundings to those with skill in region for instance the forensic marine sciences, and numerous other sciences applied to environmental issues. Environmental felonies engage a few concept of gain, rather frequently economic in nature. The growth of sophisticated accounting software for the universal community escorts to enlarge in both accounting mistakes and absolute deception. In the direction of assist uncover the details of financial schemes, money laundering, and digital deception on the Internet, an important area of inquiry connecting forensic accounting has been developed.

The computer crime and cellular telephony investigation are the emerging field of forensic science today.³¹ Computer forensics has turned into significant since a new intrusion to gain or fraudulent information in other computer systems by criminals using computer technology to support their behavior has become a main offense bustle.³² Computer can be received as evidence in financial crimes, computer frauds, espionage, and sabotage, data communication network terrorism, murder, drugs, cellular frauds, child pornography and almost every other investigative classification. The computer forensic investigation involves dealing with technically complex issues such as cracking computer security schemes, repair or modification of damaged hardware or storage media, retrieving hidden or corrupted data, incompatibilities of proprietary or non-standard data or storage media formats, analysis of extremely large volumes of data, review and assessment of complex operating or

³¹ *Supra* 14, 210.

³² "Computer investigation and forensic science", *available at* : www.abfde.org/.(visited on date 12-11-2011).

application software, low level analysis of storage media format and files structure and destructive traps used by criminals.³³

2.6.4 Jurisprudence

Black's Law Dictionary defined Forensic as "belonging to courts of justice." Forensic science is the application of science to assist courts in resolving questions of facts in Criminal and Civil trials. At the crack of dawn of the recent millennium, on the other hand, the jurisprudence of forensics applies a definition broader than that of "forensic science."³⁴

The law of evidence defined many areas of forensic science as "technical or other specialized knowledge" which are being analyzed or and evaluated by courts under different standards of reliability. In this historical perspective, the common meaning of forensic science is the application of "scientific, technical, or other specialized knowledge" to help courts in deciding questions of fact in civil and criminal trials.

Judges and lawyers play a pivotal role in administering the proceedings of the court. The lawyer by whom the expert testimony apply in civil and criminal trial before court must have knowledge of forensic law that govern the admissibility of forensic evidence, and must be qualified enough to apply this law to present and challenge forensic proof in deposition and court proceedings. The judges must appreciate all the matter and make sure of the legality of the whole process.

Even though every declaration and court manifestation is an exclusive practice, forensic witnesses may rationally wait for that express and cross-examination will cover at least a small number of key areas. The lawyer might create a threshold investigation into the area of specialty in which the witness claims to be an expert, reliability of that field of knowledge for judicial purposes, and the witness' credentials in that field. This investigation may deal with some and the entire formal learning the witness has or has not finished. Learning in the field of particular awareness in which the witness asserts to be specialist will be most pertinent. Any publications or other instructive resources authored or abridge by the witness and others in the field may be evaluate and tackle to either support or challenge the

³³ *Supra* 21,210.

³⁴ Jay A. Sigel, Pekka J. Saukko and Geoffrey C. Knupyr (ed.) "Forensic science" 1070, Encyclopedia of Forensic Science (Academic Press, 2000).

witness' opinions and conclusions. Proficient or technological training in the area of interest, the witness' recital in that training, and certifications or other qualifications linked to the field of specialty, might also be addressed.

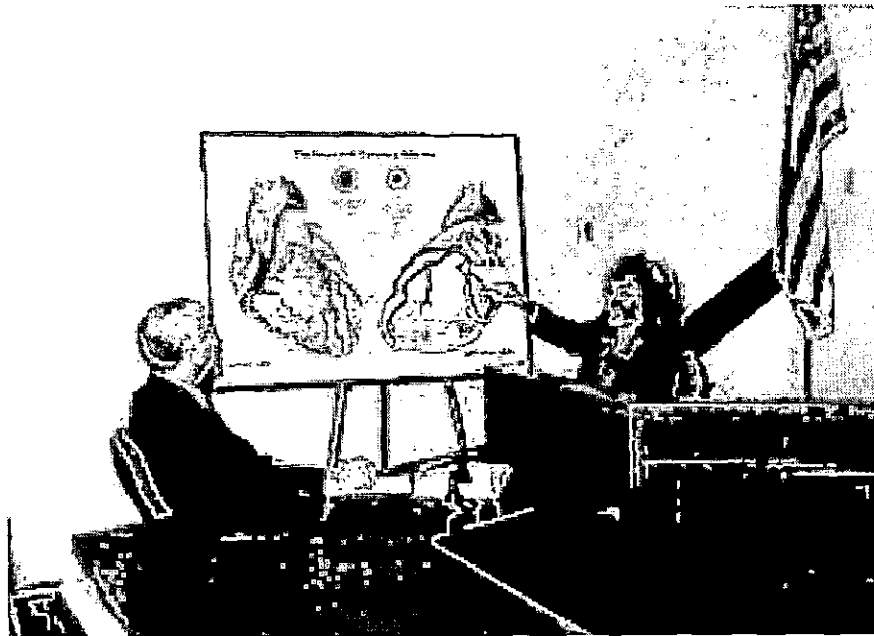
The knowledge of the witness in the area of particular awareness may too cover, in common with any matters connected to the witness who is capable in presentation in the area. The witness' presentation at work contains written and verbal performance assessment, penalizing procedures, and any other proof pertinent to the witness' experience may be inspecting. Statement of the witness in other court proceedings may also be addressed if it may be used to challenge the dependability or soundness of the witness' opinion in the case at hand.³⁵

Express test by the legal representative who keep hold of the witness will development in a way that permits the witness to favorably state the witness' learning, instruction, and experience in the witness' area of specific awareness ; the facts of the case on which the witness relied in making any description, précising, or preparing any view for the case; any assumptions, process, , or procedures applied by the witness in understanding and interpreting the facts; and any conclusions or opinions the witness may have reached as a result of this process. Direct examination is characteristically a smooth, relaxed elucidation of the witness' experience, way of thinking, and view.

Cross-examination by the opposite counsel is characteristically more complicated. The chief objective of cross-examination is to recognize any weak point that may demoralize the significance, dependability, and/or legality of the witness' evidence. Weak point will be sought in the witness' experience, awareness of the scope, restrictions, soundness, and dependability of the witness' field of specialty, application of the field of particular awareness to the facts of the case, and/or relevance of the evidence to the issues in the case.³⁶

35 "Role of medico-legal expert", *available at*: www.forensicexpert.com(visited on date 25-10-2010).

36 "Forensic Odontology", *available at* : <http://www.aoac.org>.(visited on date 13-06-2011).



Courtroom Testimony of an Expert Witness Describing Verdict in a Case

2.6.5 Odontology

Forensic dentistry (odontology) is an essential branch of forensic science that includes the application of dental science to the identification of unknown human remains and bite marks, using both physical and biological dental evidence. Odontology is the study of teeth and their morphology, anatomical and pathological changes due to age. In case of mass killing, such as bomb explosion, air crash etc., forensic odontology is highly useful techniques for identification of the deceased from their skeletal remains.³⁷

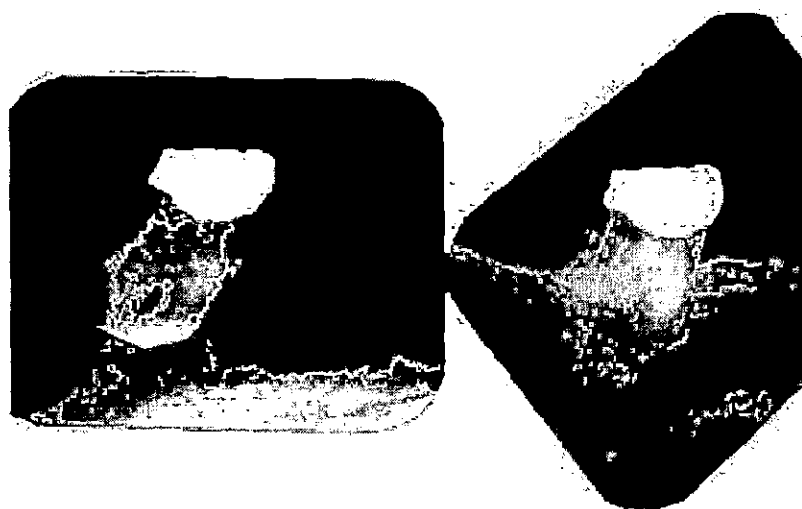
A wide range of medico-legal problems are dealt with by forensic dentist. Recognition of the human remains of natural disaster, unknown and missing person, terrorist activities etc is a central activity. Participation in autopsy examination may be included at the requirement of law enforcement coroners, or medical examiners at the local or state level. The post-mortem dental examination of human remains generally includes charting dental and cranial features, radiographic (x-ray) documentation of these features and forensic report writing regarding these findings. The application of these findings to investigation by law enforcement to recognize the missing or unknown person is second step.³⁸

³⁷ *Supra* 16,215.

³⁸ *Ibid.*

The recognition of unidentified persons may initiate at a misfortune or felony panorama or throughout the postmortem examination at the demand of the law enforcement authorities, coroners or medical examiners at the local or State level. By means of both physical, biological and dental proof (a whole or fragmented jaw or some teeth), the postmortem test consists of a visual test and X-rays. A written report is prepared of the information collected during this examination along with cranial features. This information is either used by the law enforcement agencies to help in the examination and/or coded into a processor recognition plan that include both antemortem (before death) and postmortem (after death) dental record.³⁹ The processor compares these records in an attempt to match the unknown with known samples, records, or photographs. One more significant field of forensic dentistry is bite mark analysis in the cases of assault, rape, and/or homicide. This is demanding work with rigorous standards requiring special training and experience. Inexperienced odontologists usually consult senior odontologists to serve as mentors when embarking on actual casework.

Odontologists also give expert testimony in civil litigation involving dental issues for instance personal injury law, workers compensation, professional malpractice, and disputes concerning aspect of the dentist/patient connection.⁴⁰



Two Dental Radiographs. Left is Taken after Death; Right is Before Death. The Metal Crown and Dental Structures have Similar Outlines

39 "Forensic odontology", *available at*: www.winid.com(visited on date 23-10-210).

40 "Role of forensic odontologist in criminal cases", *available at* :www.asfo.org.(visited on date 15-12-2011).

2.6.6 Pathology/Biology

Pathology is a medical area of expertise the study of disease. Pathologists examine disease by applying a kind of operation which is called an autopsy and observing the tissues detached, and by examining surgically detached specimens under the microscope. By examining the fluids taken from the body such as blood or urine, the pathologist get vital information about the disease. Forensic biology is the application of biology to law enforcement.⁴¹

Forensic pathology is the application of the principles of pathology, and of medicine in general, to the legal needs of society. Autopsies performed by Forensic pathologists to find out that under what conditions a person's death caused. The conditions surrounding the death are also involved in the inquiry. Through these conditions the method of death is lastly determine whether the death is natural or caused by mishap, suicide, and homicide or undermine.



Forensic Histotechnologist Preparing Tissue for Microscopic Slide Examination

Even though there is much importance on vicious deaths (deaths due to homicide, mishap, or suicide), forensic pathologists also examine sudden deaths of apparently fit persons (those not presently being treated for a disease so that the sudden death occur), the death of someone who has never seen a doctor (unattended), deaths taking place in police custody, doubtful or extraordinary deaths, deaths that may be the result of surgical or diagnostic procedure which could be a curative misfortune, or some deaths which happen in community institutions. The law of the

41 Dr. B.R. Sharma, *Forensic Science in India and the world* 67(Alia law Agency, Allahabad, 2008).

specific jurisdiction where the death occurs determines which deaths must be reported to the medical examiner (frequently a forensic pathologist) or, in some states, the coroner. Then it is the liability of the medical adviser or coroner to find out if an autopsy is necessary to decide the reason and method of death.⁴²



Attending and Resident Pathologists at Weekly Neuropathology Conference

The contribution and study of forensic pathologist may involve visiting the scene of death. Forensic pathologist and their investigators collect information relating with the happening at the time of death, medical history of the person and what the person was doing at the time.⁴³

The forensic test of a body involve testing the clothing on the body, body itself and an internal testing of the organ which is called autopsy. After taking the photograph of the body, a detailed report is prepared by the forensic pathologist describing any injury or disease process. The autopsy generally involves microscopic testing of the tissue of the body etc. X-rays may also be taken to look for bullets, broken bones, or other deformity.

The forensic pathologist work with other branches of forensic science. The forensic pathologist may gather proof from the body such as blood, hair, swab and fibre from the body and cloths of the dead person. These are sent to the forensic laboratory for testing by a criminalist. Samples for instance urine, blood, stomach content, bile, body tissue are also gathered by the forensic pathologist for toxicology analysis. These samples are checked by the pathologist for the presence of drugs,

42 "Forensic Pathology", available at :forensicscience.com (visited on date 23-10-2010).

43 *Ibid.*

alcohol and chemical or poison in the body. If bullets, shotgun pellets, or wadding are recovered at autopsy, they are also sent to the forensic laboratory for test. A firearms adviser examines these samples and is frequently capable to match them to a specific gun.⁴⁴

Forensic pathologists play a significant role in the field of public health and disease and prevention of injury. Control and identification of epidemic disease as well as observance of faulty consumer product design, which may cause injury or disease are significant for both the forensic pathologist and society as a whole. In addition, genetic disorder common to a particular family may be recognised and reported to those affected.

Forensic pathologists also play a significant role in the field of clinical forensic pathology. Types of injury are not only seen at the time when the persons are deceased, it can also be identified in living patients in emergency rooms and clinics. This is especially critical in cases of elder and child abuse. The interpretation of these injury is not valuable to police or other law enforcement agencies in a criminal investigation.⁴⁵



Forensic Pathologist's Microscopically Examining Autopsy Slides for Signs of Disease and Trauma

⁴⁴ *Id.*

⁴⁵ "Forensic pathology", available at: <http://www.soft-tox.org/>. (Visited on date 24-09-2010).

2.6.7 Physical Anthropology

Forensic anthropologists are often named to recognize persons died in calamity such as plane crashes, blast, fires, and other misfortunes consequential in the loss of life and disfigurement of bodies.

In this society, recognition of the dead is significant for various causes. The first step in homicide inquiry is generally finding out the uniqueness of the victim. This not only connected relations of the deceased, but it is also linked with the judicial authorities who required to make out whether someone is alive or dead so that will can be read, estate can be settled, second marriage can be arranged and so forth. Law enforcement agencies required knowing if recovered bones are human or non-human. If they are human and of recent origin, the individual must be recognized, and the reason of death and time elapsed since death need to be determined. If they are old, human bones, perhaps a burial ground has been uncovered.



Anthropologists Using a Metal Detector for Recovery of Materials During Crime Scene Analysis

The scientist performing this task generally a physical anthropologists who are expert in the field of human skeletal biology. Physical anthropologists have a lengthy custom of the study of human skeletal remainder from primitive civilization. The technology has been developed by them for determining health status, sex, race, mark of occupational stress and trauma and occupational tension, and height in life also have inveterate very valuable in forensic sciences.

In the recognition of skeletal material forensic anthropologists are thus expert. Additionally to their efforts to document, age, sex, stature, race, and other characteristics of the samples under examination, they are familiar with many kinds of injuries and can work with forensic pathologist to ascertain reason of death. A lot of forensic anthropologists have training in archaeological techniques and help law enforcement agencies in the first inquiry of felony sight. Anthropologists can generally concert (recover) human remain from different kind of forests, rivers system, desert, etc, with the help of analysis of soil and vegetation pattern and testing of animal remains.

A few forensic anthropologists are expert in the art of facial duplicate which includes the modeling of how a face may have appeared in the living subject for which the only surviving proof is a skull. Other forensic anthropologists have developed expertise in the determination of time elapsed since death by testing insect remains (entomology) and states of body decompositions.⁴⁶



Skeletal Remains are X-Rayed and Studied to Provide Additional Information as to Who the Person was and Possibly the Cause of Death

2.6.8 Psychiatry & Behavioral Science

Forensic pathologist and psychiatrist addressed a wide range of legal issue because they work with civil and criminal cases and other field such as law relating to domestic and family. In criminal law the main focus is on the matter relating with competence and the assessment of the mental illness etc. Civil law needs evaluation of such issues as involuntary psychiatric hospitalization, right to refuse treatment, competency to participate in do-not resuscitate decisions, and disability compensation

⁴⁶ "Forensic anthropology", available at: [http:// www.abjp.org /](http://www.abjp.org/).(visited on date 23-10-2010).

among others. Issues in family and domestic relations may include juvenile delinquency, child custody, parental fitness, domestic abuse, adoption, and foster care.

Forensic pathologist and psychiatrist spend a significant amount of time in interfacing with judges and lawyers, so that they trained in giving expert testimony.

In organizing the components of a forensic psychiatry assessment, a four-step series of the following questions is often used:

- What is the specific psychiatric-legal issue?
- What are the legal criteria that decide this issue?
- What are the relevant psychiatric-legal data?
- What is the reasoning process used to reach the concluding opinion?

A single person may represent several different issues, each of which may be addressed separately. For instance, in criminal law the question may be asked from defendant about his criminal responsibility for the offence, the likelihood of his being dangerous if he were discharged to the community, the validity of the confession made to police officers, his capacity to abide by the terms of probation if applied etc. Some of these issues show the past (for instance at the time of the alleged crime the mental functioning and behaviour of the accused person or at the time of confession), some issues show the present (competence to cooperates with legal counsel), and some show the future (abiding by the terms of probation). The difference between data which has been gathered by the psychiatrist depend upon the fact whether the psychiatrist is showing past, present or future mental functioning and behaviour.⁴⁷

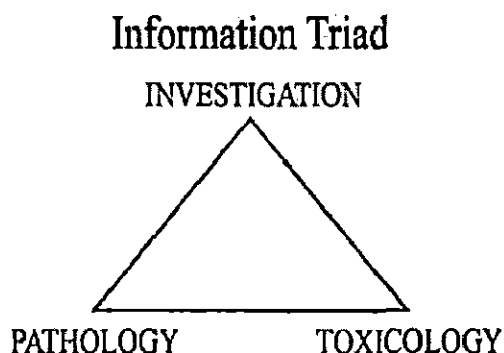
2.6.9 Toxicology

The earliest documented forensic specialty could probably be considered to be forensic medicine, also known as legal medicine or medical jurisprudence, and is the application of medicine and medical science to answer legal problem. The development of modern -day chemistry is considered to have begun at the end of the eighteen century, paving the way for the development of modern toxicology.⁴⁸ Toxicology is the study of harmful effects of chemicals or drugs on living systems. Forensic toxicology is that branch of forensic science which deals with the medico-

⁴⁷ "Psychiatry behaviour in forensic science", available at: www.forensicscience-society.org.uk/(visited on date 29-11-2012).

⁴⁸ *Supra* 11, 1071.

legal aspects of toxicology. Forensic toxicologists answer the question, "Did prescription or illegal drugs and/or alcohol lead or contribute to the person's death or intoxication?" Answering this question often needs forensic pathologists, law enforcement officers, forensic toxicologists, other forensic scientists, and crime scene investigators to work together.⁴⁹



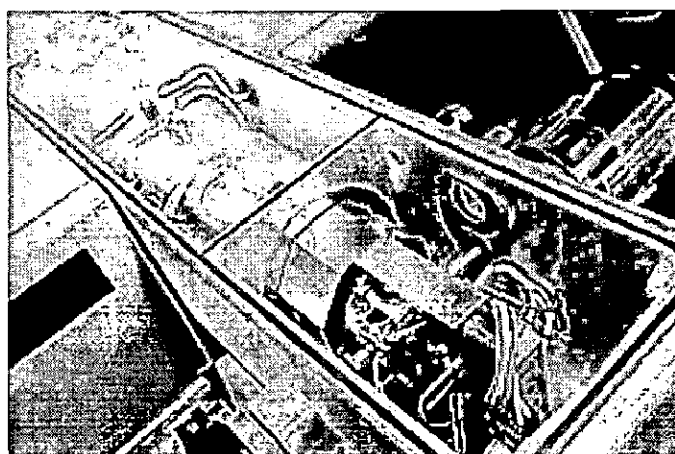
The Information Triangle - A Collaboration of Input and Information from Three Areas: Toxicology, Pathology and Scene Investigations. This can lead to the Interpretation of a Cause and Manner of Death

There are several areas of specialization within the field, which offer a variety of career paths. One, postmortem toxicology, includes the determination of the contribution of drugs or other chemicals to the circumstances of the death. The forensic toxicology laboratory contributes a critical perspective to a death investigation, working with a forensic pathologist, and scene investigators, to determine which drug analyses or poisons are involved. This is accomplished by performing tests on body fluid and tissue samples received from the forensic pathologist, and then assisting with the interpretation of the findings. This effort requires knowledge of analytical chemistry techniques, including instrument methods utilizing gas and liquid chromatographic techniques, mass spectrophotometry, UV-Visible spectrophotometry, flame emission and absorption spectrophotometric techniques, antigen-antibody immunoassay methods, as well as, traditional qualitative and quantitative methods of analysis. An inquiring mind is required, along with the ability to apply knowledge of chemistry and pharmacology to solving real world puzzles.

⁴⁹ "Scope of forensic science", available at: forensicsciencedna.com (visited on date 17-02-2012).



Instrumental Automation as Exemplified by the Automated Sampler which can Extend the Work Day and Lead to Increased Case Analysis and Decreased Turnaround Time



The Ion Source in a Mass Spectrophotometer. Gas Chromatography/ Mass Spectrophotometry (GC/MS) is a Technology that Represents a Definitive Means of Identifying the Presence of a Substance

Other forensic toxicologists function with law enforcement authorities in the examination of offense in which alcohol or drug used by individuals is an ingredient of the offense or may be a protection. This includes the analogous application of technology as in setting of the death inquiry, but characteristically deals with lower concentrations of drugs, which needs greater sensitivity of testing. The interpretation of the examination outcome in this field is the utmost challenge, applying knowledge from clinical and medical studies, and experience in the field, to give a view about the affects of a drug or mixture of drug on an individual at the time of the offense or accident.

Workplace drug testing and forensic urine drug testing has become a significant feature of employment and industries with hazardous work conditions or jobs affecting the safety of others. This aspect of forensic toxicology is generally limited to the recognition of particular drugs of abuse in a large number of urine samples with some laboratories performing tests on over 10,000 urine samples every day. As with all of the forensic environments, there is a strong emphasis of record keeping, chain-of custody documentation, stringent quality control, and data management. The challenge is to get the testing of such great numbers done as reliably and efficiently as possible. Developments in this area include the evaluation of specimens other than blood or urine for drug testing, such as sweat, hair, and saliva.⁵⁰

Forensic toxicology testing also contributes in other area, as varied as wildlife crimes involving the poisoning of animals, the use of drugs to facilitate sexual assault, and drug use and doping in human and animal sports. In all of the aspects of forensic toxicology, the interpretation of the results is a consistent challenge. The results obtained are determined by tests that are complex and difficult for most juries and lawyers to fully understand and appreciate. Therefore, the toxicologist must have or develop the ability to describe the process involved, the findings determined, and the relevant interpretation derived in a straightforward and easily understood manner.⁵¹

2.6.10 DNA profiling

Evolving from classical Serology, DNA *profiling* could be considered as the modern-day technique revolutionizing personal identification in forensic science. In the mid-1980 Sir Alex Jeffreys developed the technique allowing the profile analysis of DNA after publishing his achievements in Nature in 1985. Jeffreys was subsequently called upon to apply his techniques to solve the first crime in 1986. In combination with the British Home Office Forensic Science Service, his DNA profiling techniques were used to identify Colin Pitchfork as the murderer of Dawn Ashworth and Lynda Mann in Leicestershire, England. Cetus Corporation furthered the developments of DNA profiling and molecular biology techniques in the personal identification during the rest of the 1980 with the development of the Polymerase

50 B.B. Nanda and R.K. Tiwari, *Forensic Science in India, A Vision for the Twenty- First Century*214 (Select Publisher, New Delhi, 2001).

51 "Forensic Toxicology", available at: [http:// www.soft.tox.org/](http://www.soft.tox.org/). Visited on date 12-02-2012).

Chain Reaction. In 1987, not only was DNA profiling introduced for the first time to some criminal courts, but the admissibility of DNA evidence was also challenged, resulting in the development and implementation of appropriate accreditation, standardization and quality controls for DNA and forensic laboratories. During 1996, the FBI DNA Analysis Unit began using mitochondrial DNA analysis. This type of analysis can be applied to small or degraded quantities of DNA from hair, bones, teeth and body fluids, allowing the examination of evidence that may not have been suitable for comparison prior to the development of this technique.⁵²

2.6.11 Forensic Polygraphy

The society owes a commitment to the people that the potential and might of the state is not abused in dispensation of justice and that the concept of human rights is upheld and nurtured all the time. The preserve his common rights, the basic tool human being have devised is the police set-up. Death, rape and torture in police custody are common, factual reports have embarrassed several State Government and their police outfits which employed third degree methods in the interrogation of the suspected people detained to reveal the truth or their plans. The third degree methods will never put an end to the crime as the criminals get establishment. Interrogation of the suspected criminals using third degree methods results into loss of fear and respect for the authority of the state. The law enforcement machinery in the country will have to react effectively by scientific interrogation of the victim and the accused and try to get as much of evidence as possible to establish the charge. This is to be done by resorting to forensic polygraphy technique, available in most forensic science laboratory in the country.⁵³

2.6.12 Forensic Chemistry

The chemistry department is usually the largest single unit in a forensic laboratory (followed by the biologist). The kind of materials handled are paint and glass- often resulting from vehicle crashes or hit- and- run accidents. The chemist is also responsible for the examination and matching of impression, such as tyre and shoe-print and tool marks left at the scene of a crime normally during the process of illegal entry.⁵⁴ Illegal drugs are a growing international problem, and this is reflected

52 "DNA Profiling in India", *available at*: www.forensicedna.com (visited on date 21-10-2010).

53 *Supra* 41, 213.

54 Brian Lane, the Encyclopedia of Forensic Science 5 (BCA Publication, London,).

in the case-load of the World's forensic science laboratory. The situation is complicated by the ever increasing number of new drugs that are finding their way from the pharmacist's shelf to the street, and the huge increase in what are called 'designer' drugs, a cocktail of existing substances in new combinations to satisfy a cultural or fashion need. In this respect, the forensic chemist will have not only substance to analyze, but the equipment from illegal drug factories and the paraphernalia of drug use; on top of which are the blood and urine samples from alleged users passed on the police surgeon.⁵⁵

When a pathologist has completed his post-mortem examination of a suspected poisoning case, it is usual for the whole of the stomach contents-probably accompanied by the stomach itself- the small intestine, and most of the internal organs to be dispatched to the forensic science laboratory for qualitative and quantitative analysis of possible toxins.

2.7 Conclusion

The analysis of the aforesaid presentation amply reveal that forensic science can contribute a lot for getting speedy justice to the contemporary society if the above said measure are taken care for due and effective implementation. The quality and undelayed reports from the forensic scientists shall certainly fulfill the aspiration of the society from the forensic professionals.⁵⁶ At present time because of the fact that criminals are adopting new modern sophisticated techniques in committing the crimes, so, it is not possible to solve the crime without applying the new scientific technique. Therefore the importance of forensic science is fast increasing in the present time because with the help of forensic science and its new techniques the mystery crime can be easily solved. The scope of forensic science is ever-increasing with passing of the time. There are various branches of forensic science which are really very helpful in detection and in solving the crime and in finding out the criminal.

⁵⁵ *Ibid.*

⁵⁶ Dr. J.R. Gaur, *A Compendium of Forensic Science* 22 (Shiv Shakti Book Traders, New Delhi, 2006).

Chapter III

Modern Techniques in Forensic Science and their Utility in the Criminal Justice System: An Overview

MODERN TECHNIQUES IN FORENSIC SCIENCE AND THEIR UTILITY IN THE CRIMINAL JUSTICE SYSTEM: AN OVERVIEW

3.1 Introduction

“Today we see enormous changes being brought about by science. The whole context of life is changing. As a matter of fact, looking back at least half century with which I have been more or less concerned and some of you also see that enormous changes have been brought about chiefly by science and technology. This pace of change is growing and I have no doubt that another fifty years hence you will see even greater changes not merely in spaces researches but something affecting human life. In order to participate in this movement, you should build yourself up in the science and technology.”

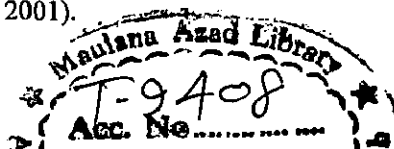
Pt. Jawahar Lal Nehru

The nature of law is dynamic and not static, so the law also changes when society change. The law is the cement of the society and the judiciary has the responsibility of interpreting the law for the greater good.¹ The application of science and technology to the detection and investigation of crime and investigation of crime and administration of justice is not new to India.² In spite of this many people are not aware from the fact that science plays an important role in the identification of crime and criminals. The area of its operation is quite wide and comprehensive. In its application to the administration of law, it is known as “Forensic Science”. Earlier it was forensic medicine, which first came to the field of the science in as such as medical man’s opinion has been sought throughout the ages to find out the cause of death of a person both in case of natural or of unnatural death.

The area of forensic science is changing very fast by the new technologies and methods. Nowadays use of DNA tests, high-performance liquid chromatography, mass spectrometry, 3-D computer imaging, and other sophisticated technologies are used by scientists to reconstruct the offence and the mishap. The modern forensic

1 Philosophy propounded by Jeremy Bentham and John Stuart Mills.

2 B.B. Nanda and R.K. Tiwari, *Forensic Science in India A Vision for the Twenty First Century* 28, (Select Publication, New Delhi 2001).



science can differentiate trace element and organic materials down to the level of merely a few hundred molecules.³

Given the sensitivity of the instruments, forensic scientists require adhering to rigorous procedures and standards to make certain that their outcome are valid and dependable and can withstand inspection in the courts of law and the community. The recent forensics can facilitate to expose concealed offense, convict the guilty and vindicate the innocent if it exercises with care. At present, multifaceted science plays an important role in recognizing sufferers of offence, mishap, tragedy, and combat which provides assurance, conclusion, and poignant support for bereaved's survivors.⁴

The characteristic of our criminal justice system is the attentive look for reality. Our technique of inquiry, rules of criminal procedure and appellate procedure are fundamentally designed to make certain that the responsible are punished whereas the innocent are protected. However, while ours is a system to be appreciated, it is not an ideal system, and those charged with the administration of justice have a responsibility to seek its continued improvement.⁵

Science and law, two distinctive professions have more and more become co-mingled, for making sure a fair procedure and to observe that justice is done. Nowadays the legal system has to pact with new scientific proof on many instances, which has posed profound challenges for the law. At basic level, many of these challenges occur from fundamental differences between the scientific and legal procedure. The quandaries are self-evident. On one hand, scientific proof holds out the alluring chance of tremendously precise fact-finding and a decrease in the ambiguity that frequently accompanies legal decision-making. Simultaneously, scientific methodologies often contain risks of ambiguity which the legal system is unwilling to bear.⁶

Additionally, at every instance, scientific proof examination of the capability of judges and lawyers, all of whom may lack the scientific proficiency to understand the proof and evaluate it in an informal manner. Lawyers must make efforts to

3 "Innovative techniques of forensic science", *available at* : www.therapyceu.com (visited on date 16-07-2012).

4 *Ibid.*

5 *Ibid.*

6 *Id.*

understand the difficulty of scientific investigation and expressions if they are to fully comprehend testing procedures and consequences, and their impact in the legal field. One modern development in the scientific community that has had a substantial and almost mesmerizing impact on the legal profession is the development of lie detection and Narco-Analysis in criminal cases.⁷

Usually, forensic science is the application of science to find out the answer which required by the legal system. These answers may relate to civil or criminal actions. At present it is also very much related with scientific field. Forensic science which is used to answer criminal question provides answer though the comparison with, controlled substance, biological proof a firearms that may be found at the site of the offence. In Addition to this, with the help of trace proof and impression proof like fingerprints, tire tracks and footwear impressions and all other proof that may be found in a scene of offence, the required answers for criminal examination can be found with the help forensic science.⁸

The proof found on the site of the offence is generally produced in the crime laboratory and it is this branch of forensic science that is used in the media and shown in fiction stories and programs. Besides this, forensic science has other disciplines. It is used for solving disputes as in forensic accounting which is the study and understanding of accounting evidence. When one speaks of forensic economics, it relates to the branch of forensic science which studies economic damage that leads to the loss of a business, household services or business profits.⁹

In forensic engineering, one would be able to find out the cause for the failure of a device or structure. On the other hand, forensic anthropology is a branch of forensic science which helps in the recognition and recovery of any skeletonized human remains. When the legal system needs linguistic expertise, forensic linguistic is generally resorted to. Odontology is the branch of forensic science which deals with the study of teeth.

An additional branch of forensic science is forensic photography, in which the accurate reproduction of a crime scene to be presented to a court of law is involved. Forensic psychology and psychiatry are taken into consideration by the court of law

7 "Forensic science and it s techniques", *available at*: airwebworld.com (visited on 17-03-2011).

8 "Innovative methods of forensic science", *available at* : physicspost.com (visited on 20-05-2011).

9 *Ibid.*

for providing human behaviour in legal matter. Forensic science in which the effect of drugs and poison on a person is dealt is known as toxicology.¹⁰

In the field of entomology, one finds out the outcome of insects found in, on and around human remains with the help of this, it is feasible to find out the location of death and time of death and if the body was moved after death, the location of place. So it can be seen that forensic science plays an effective role in solving the complicated and unsolved cases.¹¹

From the time immemorial crime has been a part of human society. The requirement of law and various kinds of legislations was felt when crime started the very existence of the human society. There are various kinds of laws and regulation which fight against the crimes in the society. Crime is both social and economic phenomenon, by which whole human society gets distressed.¹² The nature of the crime has been also changing and diversifying with the growth and development of the society. Presently, the guardian of law took the help from many techniques and advancement of science for fighting against crime. Many advancement have taken place in the field of forensic science which has been welcomed in the criminal investigation. Some of such advancements are discussed below in brief. However, any discrepancies that may have crept in are regretted.¹³

It can be said that crime was present from time immemorial. Likewise, the investigation and detection of crime is also quite old. With the advancement of science and technology, the criminals have adopted new methods and techniques for committing offence, but science also helped the investigating authorities in their efforts to find out the criminals or real culprits. The Forensic Science is one of advanced techniques used in recognizing crimes and criminals. It is very challenging, charming, dynamic, and exiting science.¹⁴ The application of advance science which embraces all institution like Chemistry, Ballistic, photography, Physics, Brain Fingerprinting, Toxicology, Narcotics, DNA Profiling, Narco-Analysis, Biology, etc in criminal law is commonly understood as the forensic science in the field of law.

¹⁰ *Supra* 7.

¹¹ "Forensic Science", available at: physicspost.com (visited on 12-12-2010).

¹² "Technologies of forensic science", available at: blogs.rediff.com (visited on date 16-05-2011).

¹³ "Advancement in forensic science", available at: www.allfreeessays.com (visited on date 23-03-2011).

¹⁴ Deepak Ratan and Mohd Hasan Zaidi, *An Introduction to Forensic Science in Justice Delivery System* 13 forwarded by Keiichi and Chikushi, (Alia Law Agency, Allahabad, Edn. 2008).

The main functions of forensic science are the detection, collection, packing, transportation and analysis of physical evidence and biological material etc.

3.2 Narco-Analysis Test

Narcosis is a state of stupor induced by drugs. The use of narcotics as a therapeutic aid in psychiatry is believed to have a history dating back to the use of opium for mental disorder by the early Egyptians.¹⁵ Earlier in the 20th Century the medical doctors started to use scopolamine together with morphine and chloroform to induce a state called 'twilight sleep' during childbirth as these have the effect of sedative. However, scopolamine was also known to create a state of disorientation, confusion and amnesia during the period of intoxication.

Narco-Analysis is a process whereby a subject is put to sleep or put into semi-somnolent state by means of chemical injection and was then interrogated while in this dream like state, or the process of injecting a 'truth serum' drug into a patient /suspect to induce semi consciousness, and then interrogating the patient /suspect. This process has been utilized to enhance the memory of a witness.¹⁶

In 1922, Robert House, a Texas based Obstetrician thinking that an alike method may be used to cross-examine the suspects in criminal examinations. For that reason he arranged for two suspected prisoners for investigation who were under trial and whose guilt seemed to be confirmed. Upon such investigation, both the person denied such charges and both on trial were found not to be guilty. This led Robert House to conclude that a person under the effect of scopolamine cannot lie, because there is no reason or power to think. His idea and experiment gained a lot of limelight and attention and therefore led the beginning of Narco-Analysis in criminal investigation.

During the process of Narco-Analysis test a person has no power to think due to the effect of drugs which was injected into him. His idea and experiment gained a lot of limelight and attention and therefore led the introduction of Narco-Analysis in criminal investigation.

Narco-analysis has witnessed a mixed response from the judiciary, ranging from outright disapproval to reluctant and latent encouragement. For instance, in *M.C*

¹⁵ *Id.*, 357.

¹⁶ P.Ramanatha Aiyer's Law lexicon 3121, Edn. 2005.

Sekharan v. State of Kerala, the Kerala High Court took an acerbic approach towards the process, declaring unequivocally that it is against the fundamental right of an accused. However, during 2004-2009, various High Courts have been relaxed in commenting on the civil liberties aspect of Narco-Analysis while some have decreed it a permissible practice, in conformity with Part III of the Constitution.¹⁷ Thus the judicial tryst with Narco-Analysis in the previous decade had been one of the ambivalence or approval. The judiciary possibly viewed this practice to be a solution to compare the threat to internal security faced by India during the aforementioned period.¹⁸

3.3 Polygraph or Lie Detector Test

The term 'Polygraph literally means 'many writings' therefore the name refers to a process in which selected psychological activities are recorded.¹⁹ The first attempt in this direction was made to expand a scientific instrument to identify reality or fraud as early as 1895 by Lombroso. It was basically designed to record blood pressure and changes in pulse rate. Later Larsen and Keeler designed an instrument which was further developed by John Reid in 1947. The very fundamental principle underlying Polygraph is that when a person lie he becomes nervous, which in turn causes mental excitation. To conceal the excitement which the person attempts, adrenal glands are stimulated to secrete Adrenalin, which on entering the blood stream, sets up the blood pressure and rate of pulse and respiration. All these psychological changes when recorded are collectively called Polygram, which is analysed and evaluate to find out whether during the lie detection test, the subject experienced emotional stress with any of the questions asked.²⁰

Such examination is performed on the basis of supposition that there is an intimate contact between mind and body and is performed by different components or the sensors of the Polygraph machine, which are attached to the body of the suspected person's body that is being cross-examined. The principle behind the test is that the suspect fears detection of his/her lie and creates in him/her an emotion of fear which

17 Chandan Panalal Jaiswal; v. State of Gujarat 2004 CriLJ 2992, Avtar Singh v. State of Haryana 2006 CriLJ 1866, Sampatrao Arveli v. State of Maharashtra, 2009 CriLJ 457.

18 Anjaneya das and Arun Kumar, "Narco-Analysis and the shifting paradigms of Article 20(3): A comment of Selvi v. State of Karnataka" 117 CriLJ 94(2011).

19 Yawer Qazalbashi, *Law of lie Detectors (Narcoanalysis, Polygraph, Brain mapping, Brain Fingerprinting)* 60 (Universal Law Publishing Co., New Delhi, 2011).

20 *Id.*, 65.

consequently results in psychological changes which are captured by different instrument.²¹ The blood pressure, pulse rate, respiration and muscle movements details etc recorded by the machine. This test is conducted at three stages namely pretest interview, chart recording and diagnosis. The examiners arrange a set of questions which depend upon the relevant information about the case which is provided by the investigation machinists such as the charges against the person and statements made by the suspects. The reaction which occurs during the examination of the suspect is recorded and measured. A baseline is created by the examiner by asking few question answer of which is already known to him. Whether a person is lying or not is recognized by behavioural and psychological changes, which the graph exposes. The sign of lie is derived from the base line. All such evidence is then corroborated with the other evidence collected. Keeler further developed the Polygraph machine by adding psycho-galvanometer, which would record electrical resistance of the skin.²²

3.4 Modern Advances in the Recognition of Dishonesty

Lombroso was the first to experiment with a machine measuring blood pressure and pulse to record in 1895. He is known as the founding father of criminology. It was called by him a hydroshygmograph. An identical device was employed by Harvard psychologist William Marston during World War I in espionage cases, who brought the technique into American court systems. In 1921, John Larson added the thing of respiration rate, and, Leonard Keeler, who was one of the founding fathers of forensic science, added skin conductance and an amplifier by 1939, therefore indication the birth of the Polygraph as it is known by us today. Polygraph (Lie-Detector) is based on the principle of psychosomatic interactions of an individual i.e. psychologically a change in a person's deliberately held feeling produces a defense reaction in the form of physiological changes in his blood pressure, pulse rate, respiration and electro-dermal response(GSR).²³

The main modernization in the Polygraph has been the introduction of computer to record and analyse the physiological reaction and data, although a few innovations in the input devices to increase the number of recording, to reduce the

²¹ *Supra* 5, 457.

²² "Polygraph test and its value in forensic science", *available at*: Midgetenitity, www.rediffiland.com, (visited on date -9-05-2011).

²³ "Advance deception in field of detection", *available at*: airwebworld.com.(visited on 15-02-2012).

discomfort and decrease the time for testing have also come up. Computerized Polygraphs have the following advantages:

- Operational training need less time
- make available better interpretable data
- No frequent calibrations as in traditional Polygraphs due to pen distortion.²⁴

Furthermore the successful process of Polygraph depends on the experience, personality, integrity of the examiner, proper operational environment and interrogation room.²⁵

3.5 Brain Mapping or P300 Test

Dr. Lawrence A. Farwell, Director and Chief scientist of 'Brain Wave Science' IWOA developed this test and patented in the year 1995. He was a well known neurologist. This technique is also known as 'Brain wave finger printing'. In this technique, the suspect is first interviewed and interrogated to find out whether he is concealing any important information. Then sensors are attached to the head and the person is made to sit in front of a computer monitor. He is then shown and made to hear certain images and voice. The sensor attached to head monitors and records electrical activity and P300 waves in the brain, which is produced only if the subject has link with stimulus. The subject is not asked any question. To put it simply, it simply means that brain finger printing matches the information stored in the brain with that of the related crime and crime scene. In case of an innocent person no such P300 waves would get registered during the test²⁶.

In India, the first Forensic laboratory which used this technique is Forensic laboratory of Bangalore. Proof produced by Expert in a criminal trial would be just a fraction of the totality of the evidence on the appreciation of which the judge or jury takes judgment. The Court takes into account all the other proofs at hand along with the view of the scientific expert, which is just one piece of evidence needed to be taken into consideration and appreciated for its evidentiary value. Even after the validity of the technique of brain fingerprinting satisfies Daubert's criteria, its application as a forensic tool in individual cases will depend upon the genuineness of

24 "Admissibility of Scientific Evidence and the Bias against Lie Detection available", *available at*: www.legalservice.com (visited on 05-12-2013).

25 *Ibid.*

26 *Supra* 2.

the investigation and other factors. The test would not be applicable in a case in which two suspects in an investigation were both present at a crime, but one was a witness and the other a perpetrator. The method can only detect information from their memory that would place both at the scene of the crime and it cannot decide what their roles were, thereby creating a distinct possibility of an innocent eye-witness becoming a suspect of the crime and giving a dubious opportunity to the real culprit to create a situation of doubt.²⁷ Moreover, the method would not be definitive in a case in which investigators do not have sufficient information about a crime to be able to test a suspect for crime-relevant information stored in the brain. The brain-fingerprinting analysis identifies the existence or nonexistence of information and not the guilt or innocence per se. In few cases, a person may possess virtually all the available information about a crime, although he is not a perpetrator. In such cases, possessing relevant information with respect to crime will not recognize that individual as the perpetrator and the test cannot be applied to solve the case. The heuristics proposed consists of five basic parts and emphasizes the underlying principles common to all fields of science.²⁸ It is suggested by the author that the judges and the lawyers who assist them about their cases, must be able to do five things: (i) Identify and examine the proffered theory and hypothesis for their power to explain the data; (ii) Examine the data that supports (and undermines) the expert's theory; (iii) Use supportable assumptions to fill the inevitable gaps between data and theory; (iv) Examine the methodology; and (v) Engage in probabilistic assessment of the link between the data and the hypothesis²⁹.

3.6 DNA Profiling

One of the latest growing and most reliable modes of investigation in forensic science is DNA profiling. DNA is the abbreviation of the term, "**Deoxyribose Nucleic Acid**". It is an organic substance which is found in every living cell and which gives an individual genetic blue print. DNA can be obtained from a wide variety of sources like, blood, semen, bone, saliva etc.³⁰

27 "Brain fingerprinting in forensic science", *available at* : blogs.rediff.com (visited on date 28-02-2013).

28 *Ibid.*

29 *Id.*

30 Dr., B.R. Sharma, *Forensic Science in Criminal Investigation and Trial* 4 (Alia Law Agency, Allahabad 6th ed., 2008).

DNA was first discovered by Fredrick Miescher in the year 1869. Sir Alec J. Jeffery discovered the use of DNA in forensic analysis in 1984 in England and it was first used in the famous Endbury case wherein two girls were raped and murdered.³¹ Since then scientists have developed various techniques like RFLP³² and later another technique was developed which is known as PCR.³³ PCR had advantages over RFLP as it takes lesser number of samples and replicates them in manifolds. It is quicker and cost effective. It also enabled to analyze highly degraded samples and therefore it is the most widely followed method of DNA profiling.

DNA tests are highly effective because each individual's DNA is unique except the twins. The probability of DNA being same is one in three billion. And it is credible because it cannot be tampered with. DNA test can be used in various cases in order to such as to establish the parentage of a child, identify mutilated dead bodies etc.

3.6.1 Paternity

The *raison d'être* under the Indian Evidence Act, 1872, is against the legitimization of a child and the public policy is that no child should suffer due to lapses on the part of their parents. It is well established that when certain fact is considered as conclusive proof of another fact, the judiciary generally disables the party in disrupting such proof.³⁴ The only exception occurs when the party is able to show that there was no access to the other party when the conception could have taken place. Whenever paternity is contested, the burden of proof is on the party pleading negative.³⁵

In the famous case of *Gautam Kundu v West Bengal*³⁶ the apex court has laid down certain note-worthy guidelines regarding DNA test and their admissibility in the parentage case.

1. The courts in India cannot order blood test as a matter of course.

31 "DNA test and its relevance in forensic science", available at: www.dnasource.com/archives at 15 April 2008.

32 Restriction Fragment Length Polymerase.

33 Polymerase Chain Reaction Technique.

34 Sec. 6 of Indian Evidence Act, 1872.

35 Sec. 112 of Indian Evidence Act, 1872.

36 (1993) 3 SCC 418.

2. Whenever application is made for such prayer in order to have roving enquiry, the prayer of blood test cannot be entertained.
3. There must be strong prima facie case in which the husband must have established non-access in order to dispel the presumption arising under section 112 of Indian Evidence Act, 1872,
4. The court should carefully examine as to what would be the consequence of ordering the blood test.
5. No one can be compelled to give blood sample for analysis.

In case of *Kanti Devi v Poshi Ram*³⁷ the Supreme Court held that even a DNA test that indicated that the person is not the father of the child would not be enough to rebut the conclusiveness of marriage as proof of legitimacy of child.

Section 125 of the Code of Criminal Procedure code, 1973 lamented that the natural and fundamental duty of a man is to maintain his legally wedded wife, children and parents so long as they are unable to maintain themselves.

The famous *9/11 in U.S.A* attack left none in any doubt about the great capacity and capability of the criminals of that era found their modus operandi used in the commission of such crime. Hence there is an urgent need for modification of the crime investigation process and tools were felt. The development of DNA is a welcome step and it has become more and more reliable instrument. Unlike civil paternity case, Indian courts have accepted the role of DNA in criminal paternity case. Likewise in *Rajiv Gandhi Murder Case*³⁸, the DNA samples of alleged assassin Dhanu were compared with her relatives, which gave conclusive proof about her being involved in the gruesome attack. Similarly in the famous **Tandoor murder case**, the DNA samples of the victim Naina Sahni were compared with that of her parents to establish her identity.

3.7 Fingerprints

Though fingerprints have been used by the crime investigators for more than a century, they persist one of the most requisite after pieces of evidence. All human beings are born with a characteristic set of ridges on the fingertips. The ridges, which are rich in sweat pores, form a pattern that remains fixed for life. Even if the skin is

³⁷ AIR 2001 S.C 2026.

³⁸ AIR 1993 SC.

removed, the same pattern will be evident when the skin regenerates. Some of the typical patterns found in fingerprints are arches, loops, and whorls. Oils from sweat glands collect on these ridges. When we touch something, a small amount of the oils and other materials on the fingers are left on the surface of the object we touched. The pattern left by these substances, which collect along the ridges on our fingers, make up the fingerprints that police look for at the scene of a crime. It is the unique pattern made by these ridges that motivate the police to record people's fingerprints. To take someone's fingerprints, the ends of the person's fingers are first covered with ink. The fingers are then rolled; one at a time, on a smooth surface to make an imprint that can be preserved. Fingerprints collected as evidence can be compared with fingerprints on file or taken from a suspect.³⁹

Everyone entering the military services, like the merchant marine, or any other organizations are fingerprinted. The FBI maintains a fingerprint library with patterns taken from more than 10% of the entire United States population. Each year the FBI responds to thousands of requests to compare samples collected as evidence with those in file at their library. The process of comparison has been improved in terms of speed and effectiveness in recent years by the development of automated fingerprint identification systems (AFIS) that allows the police departments with computer access to search the collection. In many other countries investigating authorities have also fingerprint data to have their records as well as if someone of them got indulged in a crime so that they can easily be found out.

Many fingerprints found at crime scenes are not visible. These latent (conceded) fingerprints, which are often incomplete, are obtained in various ways. The oldest and most frequently used method is to use a powder such as ninhydrin to dust the surface. The powder sticks to the oily substances on the print making the pattern visible. The print can then be photographed and lifted off the surface by using a tape to which the powder adheres. To search for fingerprints on porous materials such as paper, forensic technicians use fumes of iodine or cyanoacrylate. These fumes readily collect on the oils in the print pattern and can be photographed. Since 1978, argon lasers have also been used to view latent fingerprints. When illuminated by light from an argon laser, a latent print is often quite visible. Visibility under laser

39 "Fingerprint utility in forensic science", *available at* : [http://Sciencejrank.org/Pages/12822/Forensic Science Fingerprinting .html](http://Sciencejrank.org/Pages/12822/Forensic%20Science%20Fingerprinting.html). (Visited on date 14-02-2013).

light can be enhanced by first dusting the print with a fluorescent fingerprint powder.⁴⁰

Fingerprints are not the only incriminating patterns that a criminal may leave behind. Lip prints are frequently found on glasses. Footprints and the soil left on the print may match those found in a search of an accused person's premises. Tire tracks, bite marks, toe prints, and prints left by bare feet may also provide useful evidence. In cases where the identity of a victim is difficult because of tissue decomposition or death caused by explosions or extremely forceful collisions, a victim's teeth may be used for comparison with the dental records of missing people.⁴¹ Every coin has two sides. Every technology or knowledge created can be used or misused by the user. But that cannot be used as a ground to reject development of the knowledge.

Thus scientific evidence is an inescapable facet of modern litigation. The faulty analysis of scientific evidence would deprive the litigants of intellectual due process from judges and undercut the proper functioning and credibility of the judicial system. In USA, more than 140 people convicted of murder were exonerated using DNA test. Isn't it sufficient to prove the development very useful? The criminal justice system is supposed to be based on just and equitable principles. The task of the Court is to industriously understand the scientific evidence and assess its value, without being affected by commercial publicity given to the scientific inventions patented for use of science as commerce.

Our criminal justice system has to be upgraded so as to leave no stone unturned to save an innocent person and to affirm that a criminal does not get away at the cost of innocent life. Our criminal justice system says let hundred guilty one get away but let not one innocent suffer. It's high time for us to develop our system to the level that none of the criminals get away without being punished for their crime because when they are able to do so, their victims are being denied justice and that frustrates the whole system. Let's hope all these developments of forensic science would be a sufficient tool in the hands of the people fighting crime so as to arm them against it and make the system work to establish more and more just and safe place for people live in peace and prosperity⁴².

⁴⁰ *Ibid*.

⁴¹ "Forensic science fingerprint", available at : <http://science/jrank.Org/Forensic-Science-Fingerprints.Htm>(visited on date 24-10-2012).

⁴² *supra* 16.

3.8 Brain fingerprinting

Brain Fingerprinting is yet another latest innovative computer technology to recognize the criminal accurately and scientifically by measuring brain-wave responses to crime-relevant words or pictures presented on a computer screen. Brain Fingerprinting has proven 100% accurate in over 120 tests, including tests on FBI agents, tests for a US intelligence agency and for the US Navy, and tests on real-life situations including misdemeanor crimes. The same system is also adopted in most European as well as developed countries.

Brain fingerprinting is based on the finding that the brain generates a unique brain wave pattern when a person encounters a well-known use of functional magnetic resonance imaging in lie detection derives from the studies suggesting that persons asked to lie show different patterns of brain activity than they do when being truthful. Issues related to the use of such evidence in the courts would be discussed later.

In the field of criminology, a new lie detector has been developed in the United States of America. This is called "brain finger printing." This discovery is supposed to be the best lie detector available as on that date and is said to perceive even smooth criminals who pass the Polygraph test (the predictable lie detector test) with ease. The latest method employs brain waves, which are useful in detecting whether the person subjected to the test, remembers finer details of the crime. Even if the person willingly suppresses the necessary information, the brain wave is sure to trap him, according to the experts.

When a crime is committed, a record is stored in the brain of the doer. Brain Fingerprinting provides a means to objectively and scientifically connect evidence from the crime scene with evidence stored in the brain of the perpetrator. (This is similar to the process of connecting DNA samples from the perpetrator with biological evidence found at the scene of the crime; only the evidence evaluated by Brain Fingerprinting is the evidence stored in the brain.) Brain Fingerprinting measures electrical brain activity in response to crime-relevant words or pictures presented on a computer screen, and reveals a brain MERMER (memory and encoding related multifaceted electroencephalographic response) when, and only when, the evidence stored in the brain matches the evidence from the crime scene.

Thus, the guilty can be identified and the innocent can be cleared in an accurate, scientific, objective, non-invasive, non-stressful, and non-testimonial manner.⁴³

3.9 Ballistic Fingerprinting

Ballistic fingerprinting is one of the important branch of Forensic Science. It is another type of evidence. In ballistic Fingerprinting the distinctive marking left on ammunition as a result of its use in a specific weapon. During the late 15th Century gun maker found that the addition of groove to the inner surface of a gun barrel improved the accuracy of bullet fired from the gun. Bullets fired from rifled the gun barrel. The pattern of scratches on the bullet matches those in the gun barrel. A gun barrel with seven helical grooves, for example results in a pattern of seven scratches on a bullet, fired from the gun. Since rifling pattern tends to differ from weapon to weapon, the pattern they produce on bullets fired from them tend to be distinctive, perhaps unique.⁴⁴

3.10 Other techniques of forensic Science

There are other new Forensic Science techniques which are helpful in the field of forensic science.

3.10.1 Binocular for identifying Dangerous gases

It is a device, which is known as polychromatic, is developed to spot and identify gases from two miles away when attached to binoculars. The system works by identifying the holographic signature of gases using infrared light to build up a 3-dimensional pattern of the composition of the gas. Within the binocular, a small hologram is programmed to mimic the chemical signature of any gas and by comparing it with the light from the gas, the two can be matched to identify the gas. The process takes less than a millisecond and can be used to simultaneously identify number of gases. To identify the chemical weapon, the soldier can use it mainly for military and defence purposes. Fireman can also use it for the assessment of burning factories, houses and building. It may also be used for checking cars exhaust fumes in future. This device can suitably be adapted for preventive forensic application.⁴⁵

43 "Brain Fingerprint", *available at*: http://www.seminarszone.com/2013/02/download-abstract-on-brain-finger_4966.html(visited on date 07-02-2014).

44 David E. Newton, *DNA evidence and Forensic Science* 21(Viva Book Publication, New Delhi , 2006).

45 *Supra* 2, 219.

3.10.2 Remote personal assessment

It is a covert technique of forensic Science. It uses microwaves or lasers to assess the stress on the person remotely, covertly.

3.10.3 Psycholinguistic profile

It is a profile of a criminal based upon his written and spoken words and texts used by the criminal. Competent Forensic Psychologist can draw a fairly accurate descriptions of the possible criminal from the written or spoken (or both) words.

3.10.4 Criminal Profiling

It is criminal's profiling based on his action and behaviour. His acts, behaviour, mannerism and expressions are used to construct his profile.

3.10.5 Psychological Stress evaluator

It uses a voice spectrograph to study changes in vibration in the subsonic sound. Waves under interrogative stress when the subject tells lie in answer to the question, to find the truth.⁴⁶

3.10.6 Forensic Acoustics- Speaker identification

Like variation in the face, fingerprint, and other biological parameters are discernible from one person to another, the voice also differs from one person to another. Voice analysis is essentially a sound spectrograph based technique, which is used to compare the recorded voice of an unknown individual to a known recorded voice sample of a suspected kidnapper, extortionist, terrorist, and others who communicate their intent to commit violent acts. The Central Forensic Science Laboratory (CFSL) and Central Bureau of Investigation (CBI) is using the spectrographic technique coupled with linguistic analysis for forensic investigation. CFSL and CBI is also collecting acoustic and phonetic data of English and Hindi utterances from speakers of different dialects of North India for fixing their regional identity. CFSL, Chandigarh is working on the development of speaker identification system and conducting research regarding the reliability of the examination under varying conditions of recording, fidelity, interfering background sounds, sample size, voice disguise, restrictive frequency range, non-voice sounds and other factors commonly encountered in investigative matters with the help of computer and

⁴⁶ B.R. Sharma, "Advancing Front of Forensics" LVI-No. 2, The Indian Police Journal 29(2009).

artificial intelligence. With this development, the employment of voice analysis for crime investigation and court testimony purposes will become practicable in the country.⁴⁷

3.11 Relation of Forensic Science with Crime Investigation: An Analysis

Crime is as old as the human civilization. Likewise also the conviction of the wrongdoer and punishment in one form or the other also existed in society. After the enactment of various laws, the criminals are put on trial, in the courts of law for establishment guilt or innocence of a person. The guilty persons are non convicted by the courts and punished for their acts. The traditional methods have not proved very fruitful in attaining the required conviction rate. In recent years, due to the application of knowledge and techniques of forensic science, there has been relatively higher increase in the conviction of various crimes but still the conviction rate is not in balance with the crimes committed. Forensic Science in the investigation of crime and in the administration justice is surely a versatile tool.⁴⁸ Forensic Science can be defined as Criminalistic science. In other words, the scientific studies or investigation of crime can be termed as Forensic Science. Along with the development of science and technology the pattern of our society has also changed to cope with the day to day development. Accordingly the criminal also often uses different techniques for the commission of various crimes within our society. So it has become a problem for the law enforcing agencies to check the potentiality of crimes. For such checking, the need of forensic science becomes an essential prerequisite on the part of the investigative agencies.

Considering the huge necessity and importance of forensic science, the Govt. of India has established a few forensic science laboratories in the different parts of our country. Similarly the Govt. of various states have also established some forensic science laboratories. For example, the Govt. of Assam has established a forensic science laboratory at Guwahati.

Forensic Science Laboratory, Assam is a scientific institution under the Police Department established in the year 1967. This laboratory has been established in the

⁴⁷ *Supra* 30, 214.

⁴⁸ Prof. Vimla Veeraghavan (ed.), *Handbook of Forensic Science* 1(Selective and Scientific Book Publisher, 2004).

pattern of an ideal forensic science laboratory, comprising eight important branches of science like Chemistry, Physics, Biology, Serology, Ballistics, Toxicology, Question Documents and Photography.⁴⁹

The operation of forensic science is nothing but the application of techniques and methods of basic science techniques and methods of basic science for different analyses of different crimes. Since its beginning, the scientists of the Forensic Science Laboratory, Assam have been rendering invaluable service to the investigating agencies in various ways for the cause of justice.

The scientific examinations of a forensic scientist adjoins a missing link or strengthens the investigation by furnishing an impartial evidence, thus helping the courts to come to a conclusion regarding the criminals and their punishments. The field of study or examination of forensic scientist is very wide, diversible and unpredictable. Generally the duties and responsibilities of forensic scientists are very hazardous, onerous and risk bearing too. Because they are to deal with the material exhibits pertaining to various nature of crimes such as murder, rape, blood, saliva, firearms, ammunitions, explosives, and explosives substances, liquor, hashish, opium, adulterated petrol, kerosene, diesel, etc. and other chemical vehicles involved in accidents, various types of paints. Weapons used in burglary, arson, etc. different types of poisons and poisons and poisonous substances, hair, skeletal remains and other plant or animal remnants. Apart from these, forensic scientists also examine the forged signatures and documents along with the photographic analysis of all materials exhibits. Any material exhibit encountered in the way of investigation needs to be thoroughly examined to prove or disprove its association with a particular crime or criminal. Practically the forensic scientists are to examine the material exhibits connected with various nature of crimes covering the sections of Indian Penal Code and other relevant Acts and the laws of the land. Unlike other research and analytical materials, forensic scientists are required to work with limited quantity and amount of materials generally left behind or carried away by criminals.⁵⁰

For better collection of exhibits for various range of studies, forensic scientists are often summoned to the scene of crime so as to assist the investigation agencies in

49 "The Role of Forensic Scientist in Detection of Crime" Designed by Web. Com (India) Pvt. Ltd., 2006-2007. (Visited on date 15-07-2011).

50 *Supra* 18.

determining the clue by means of scientific analysis. So far, the duties and role of forensic scientists in general have been discussed. The role and nature of forensic scientist of different branches in connection with their respective and specialized field of work shall also have to be discussed.

Let us discuss about the forensic physicists. Generally the material exhibits which are obtained at the scene of crime are examined by the scientists of this division. Besides, comparative studies of various impressions and marks of tools etc. used in commission of crime are also made in this division. Determination of forced engine or chassis marks or restoration of an erased number upon metallic dates are also determined by the scientist of this division. Analysis of paints and glass articles, stamp impressions of forest authorities can be examined by these scientists to establish the relevant facts for the determination of clues of commission of crimes and criminals.⁵¹

Secondly the scientists of forensic chemistry are equally busy determining clues of crime and detection of criminals by their various methods of analysis. For instance it is the forensic chemist who has to determine purity of petrol, diesel and kerosene from samples. They are also to determine the quality of liquor, opium, ganja and other chemicals, analysis of explosive and the like. From their various methods of analysis, they have to establish facts which are based upon which the investigating officers can detect the clues of a particular crime.

Forensic biologists have also been playing an important and commendable role in examining biological exhibits oriented with crime. It is the biologist who has to analyze the material exhibit starting from a micro organism to a higher plant or an animal and also their parts and products. From the skeletal remains, a biologist has to determine the sex, origin, stature, and age of the deceased. He is to identify from the skull by using superimposition method and thereby help the investigating authority in coming to a conclusion with the regard to a particular crime. In case of a suspected death case, the biologist has to ascertain the cause of death. He has also to analyze various poisonous plant materials in cases where plant poison is administered in the commission of crimes.

51 *Ibid.*

A Serologist plays equally important role in establishing facts in respect of various crimes. In case of a murder where knife and other weapons are involved, it is the serologist who ascertains whether the particular weapon is stained with human blood or not. From the findings of a serologist, the investigating officer can get a definite clue in a particular case, depending on which the investigating officer can identify the culprit of the crime. It is the serologist who has to establish the facts of disputed paternity cases by testing the blood group in question.

Now, with regard to the ballistic branch of forensic science it may be stated that a ballistic expert is the only person who ascertains whether a particular fire arm was used or not while committing a crime. He is also to examine the types of fire arms and ammunitions used in commission of a crime. He has also to establish the facts with regard to firing ranges, distance, direction, and angle of firing. After obtaining the opinion of a ballistic expert the investigating officers can come to a reasonable conclusion in respect of a particular crime. Apart from the different fire arms and ammunitions, a ballistic expert is also expected to examine the explosive substances which are nowadays very often used for committing heinous crimes.

A toxicologist determines the clues of the crime in which the poison is used. In any such case, be it accidental, suicidal or intentional, a toxicologist analyses the viscera and other relevant materials from which he establishes the quality and quantity of the poison used. From the report of a toxicologist, the investigating officer can usually obtain vital clues for detecting the criminals involved. Similarly, the Court also gets positive evidence for coming to a conclusion in any particular case.

A document expert examines the various types of documents directly or indirectly involved in a forgery case. The forgery cases may be of different types, but all these are examined by the handwriting expert. From the report of a document examiner, the investigating agency can definitely detect the real culprit of a particular case. Apart from the forged signatures or documents, a handwriting expert often gives opinion on typed papers, time of writing and the age of the ink used for writing a questionable document. So the opinion of a handwriting expert also helps the court to reach the conclusion in meeting the ends of justice.

From the above discussion it can be concluded that the forensic scientists by the very nature of their work is duty bound for the establishment of justice to the

society. As a matter of fact forensic scientists are playing a vital role in reducing the potentiality of crime and also in determining the root causes of crime in our society.

3.12 Forensic Science Unit

The introduction of molecular techniques into environmental and forensic sciences has opened up an entirely new window of observation into our world's biology and its history. However, the very sensitive nature of such methods leaves them particularly prone to error and artifact. This is especially true in the analysis of problematic samples with sub optimal nucleic acid quantity or quality, as is often the case in microbial ecological studies and ancient DNA investigations. Numerous studies have highlighted the potential sources and extent of artifact in such molecular approaches, but such cautionary messages have generally gone unheeded. Some unavoidable sources of error and artifact are inherent to molecular studies and must simply be kept in mind when interpreting the robustness of results. Other causes of error can at least be partially addressed via good laboratory practice measures, proper controls and thorough data scrutiny. Some laboratories and disciplines have been keen to adopt appropriate measures to circumvent some of the validity issues involved in molecular studies, whereas others lag behind. Here, we identify sources of error, contamination and artifact in nucleic acid-based studies, especially as they apply to the problematic material, suboptimal in sample size, source, quality or purity. In evaluating these concerns, we further offer some considerations and suggestions to help minimize sources of error and artifacts in laboratories studying molecular ecology and evolution with frequently problematic, and usually rare, sample materials.⁵²

Thus it can be asserted that Forensic science is gaining solid ground in the area of effective crime prevention, especially in the areas where more sophisticated use of available technology is prevalent.⁵³ All it takes is high-level cooperation among nations that can help them deal with criminality. It is apparent that cooperation will not be enough on its own and this development will require a network of qualified forensic laboratories spread over Europe. Forensic science laboratories need to be better involved in the fight against crime. For this to be achieved, a good level of

⁵² Forensic science International, volume 167, Issues 2-3, 11April, p. 121-126 Ekrem Malkoc and Win Neuteboom.

⁵³ *Supra* 21.

cooperation should be established and maintained. It is also to be noted that harmonization is required for such cooperation and seeking accreditation according to an internationally acceptable standard, such as ISO/VIEC 17025, will eventually bring harmonization as an end result. Because, ISO/VIEC 17025 as an international standard, has been a tool that helps forensic science laboratories in the current trend towards accreditation that can be observed not only in Europe, but also in the rest of the world of forensic science. In the introduction part, ISO/IEC 17025 states that “the acceptance of testing and calibration results between countries should be facilitated if laboratories comply with this international standard and if they obtain accreditation from bodies which have entered into mutual recognition agreements with equivalent bodies in other countries using this international standard.” Furthermore, it is emphasized that the use of this international standard will assist in the harmonization of standards and procedures. The background of forensic science cooperation in Europe will be explained by using an existing European forensic science network, i.e. ENFSI, in order to understand the current status of forensic science in Europe better.

The function of the Forensic Science laboratory may be determined by the three factors (1) what is technically capable of being done; (2) the awareness of police forces served by it of what it can do and (3) the pattern of crime in the area which it serves⁵⁴. Forensic Science service laboratories scattered around the country, some of which are stranger on certain scientific discipline and some on other – firearms etc.

3.13 Conclusion

The Present World is the World of advance science and technology and of new researches in every field. The rate at which the globe has progressed is commendable. Advance technology has given the World an effective and precise tool for the purpose of criminal investigation. Presently forensic science plays vital role in crime and criminal detection. There are various techniques relating with the important role in detection of crime. DNA Profiling, Brain fingerprinting, Brain Mapping, Narco-Analysis, Polygraph test, Forensic photography etc. are the important techniques in the field of forensic science which play pivotal role in criminal investigation to find out the crime and criminals. At today the investigating authority are employing these effective modern techniques in solving the crime problems.

54 H.J. Walls, *Forensic Science an Introduction to Scientific Crime Detection* 6(Universal Law publishing Co. Pvt.Ltd,New Delhi, First Indian Reprint 2002).

Chapter IV

DNA Profiling and its Efficacy: An Effective Tool of Crime Investigation

DNA PROFILING AND ITS EFFICACY: AN EFFECTIVE TOOL OF CRIME INVESTIGATION

4.1 Introduction

“To assert that the earth revolves around the sun is an erroneous as to claim that Jesus was not born of a virgin”

Cardinal Bellarmino¹

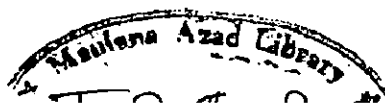
Law and science though joined hands to meet the ends of justice, have also been in uneasy alliances with each other. The fast development in the area of science and technology has resulted not only in solving the metaphysical problems but also many societal problem.² The scientific breakdown in solving many intricate criminal as well as civil problems has raised the question for their acceptance as a part of our different legal studies on its probative value, as a piece of evidence and thus forcing for necessary amendment in the related law. The major scientific development in the area of DNA technology and its facts revelation has solved many intricated crime related mysteries specially in the area of rape, mass killing either because of natural or human agencies or in solving civil dispute specially related with the paternity of a child and in finding the identity of an individual. It has also been used in solving the cases of exchange of babies in hospital wards and also protection of farmers rights and biodiversity.³ The modern day biology is seeking new and better ways to enhance our quality of life through the application of technology (Biotechnology) and rapid progress in research on human genome. The currently developing technique of DNA promises a degree of accuracy greater even than current method of finger printing suspect. DNA profiling has been used extensively for paternity testing as well as for the criminal investigation. DNA profiling has particular application to the criminal law because of the possibility that it offers of determining whether blood or semen deposits located at the scene of a crime come from a person suspected of having committed the crime.⁴

1 17th Century Church Master Collegio Romano, who imprisoned and tortured Galileo for his astronomical work, during the trial of Galileo.

2 Nikhil Gurnani, "Exclusion of DNA test under Section 112 of the Indian Evidence Act 1872: A senseless or a meaningful exclusion 117 CriLJ 115(2001).

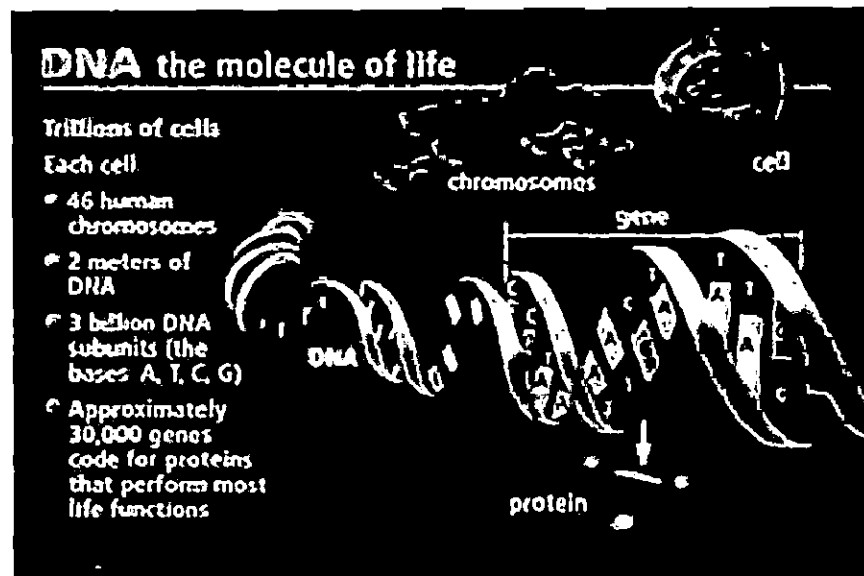
3 Dr. A.K. Srivastava "DNA Testing and Human Rights Implication in Civil and Criminal Investigation" 4CrLJ81(April,2007).

4 "DNA and Its Meaning", available at: [http:// www.forensicDNA.com](http://www.forensicDNA.com) (visited on date 9 -5-2010)



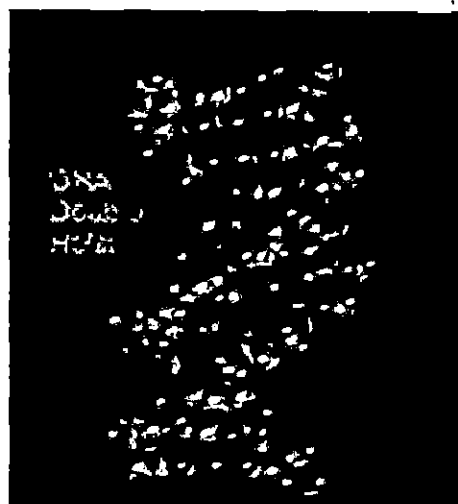
4.2 Meaning and concept of DNA: An Analysis

Life is based on earth cells; almost every cell has a nucleus and each nucleus carries a complete set of chromosomes. Human being has 23 pairs of chromosomes in each nucleus. These chromosomes carry linearly arranged genetics unit, which are materially referred as Deoxyribonucleic Acid (DNA).⁵



DNA Molecule

DNA is an organic substance i.e. the chemical basic of life, which is found in every cell found in every human body except red blood cells, which lose its with their maturity. This organic substance combining with protein forms the chromosomes, a thread like structure, responsible for carrying the genetic character from one person to its offspring. DNA is a double helical spiral structure.



Double Helix structure of DNA

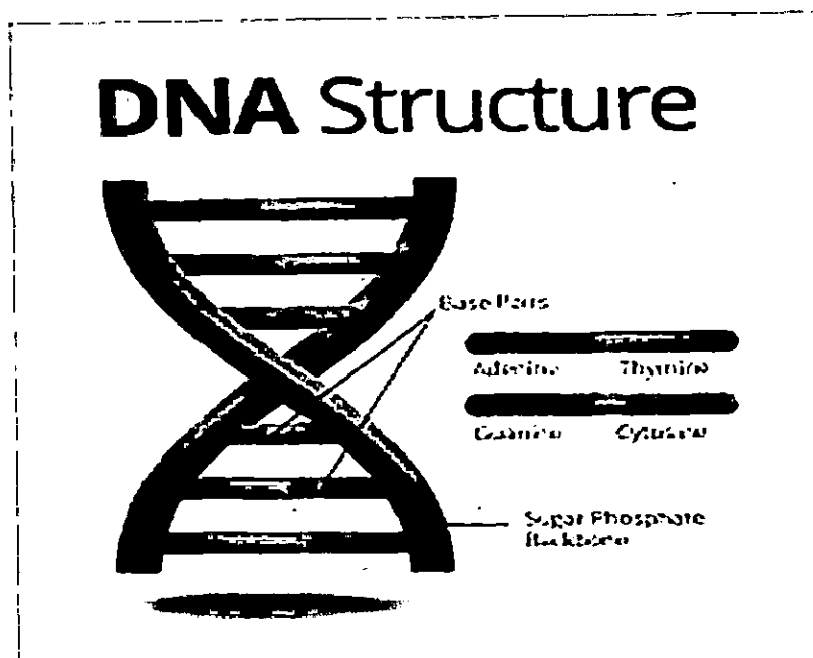
⁵ J.R.K. Abhichandani, The Gene Age- A Legal Perspective 4 date 2-5, Oct.2003

The DNA is the genetic material that makes every individual different, except for genetically identical twins. A pattern of chemical signals i.e., genetic code, has been discovered within the DNA molecules, which is very unique to each individual, just like their actual fingerprint. The significance of the fast developing DNA technology and its impact on the rights of an human being and its societal effect have produced an vital require for getting familiar with and understanding the fundamentals of recent genetic science for an effectual role by all persons who are concerned with justice delivery system.⁶ In any informed discussion about the ethical legal and social implications of the “New Genetics”, fundamental scientific surroundings is an essential requirement which need not wait till an expert witness enters the witness-box to explain to the background. According to Article 51A (h) and (j) of the Constitution of India, it shall be the duty of every citizen of India “to develop the scientific temper, humanism and the spirit of inquiry and reform”; and “to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to the higher levels of endeavour and achievement.”⁷ The Parliament is proficient to create laws with respect to the government agencies and institutions for specialized, professional or scientific training, encouragement of special studies or research, or scientific or technological help in the investigation or recognition of offense and with respect to coordination and determination of standards in institutions for higher education or research and development scientific and technical institutions (Entries 65 and 66 of the Union List). The Constitutional provisions of the country pay attention of the scientific developments that may have effect and might be place to use for the advantage of the nation The Constitution provides competent stability for balancing between public and private interests and the Courts have place to use its provisions for an effective social engineering to guard both the appreciated human rights accepted in the Constitution and the paramount public interest in a welfare State. The DNA of each gene is characterized by a unique sequence of bases that form the ‘genetic code’.⁸

6 “Importance of DNA In Genetic Science”, *available at*: gujarathighcourt.nic.in (visited on date 21-04-2011).

7 *Ibid.*

8 *Id.*



Structure of DNA

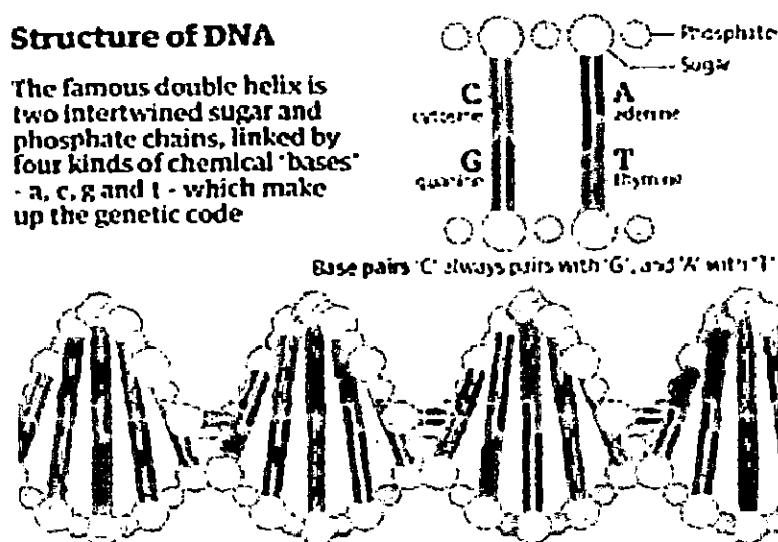
These bases are arranged in groups of three, known as codons or phrases. The base sequence is the crucial feature of the gene. It is this sequence that carries the genetic information essential for the synthesis of an RNA molecule that may subsequently direct the synthesis of a protein molecule or may itself be functional in the cell. This process is called gene expression and it has two stages. The first stage in gene expression is transcription (the process by which RNA directs the synthesis of a protein). In a DNA molecule four nitrogen bases are present which are Adenine (A), Thymine (T), Cytosine (C) and Guanine (G), which are grouped together by a bond as A=T and C=G, and are joined together by a bond called nitrogen bond⁹. The two chains link together in a ladder-like shape, twisted into the now famous double helix first described by James Watson and Francis Crick in 1953, who were awarded the Nobel Prize for their work “‘A Structure for Deoxyribose Nucleic Acid’ (1953) 171 Nature 737. Linkage of the chains follows a strict rule, known as complementary base pairing, so that the base A can only pair with the base T, and vice versa and the base G can only pair with the base C, and vice versa. The human genome is comprised of about 3.2 billion of these base pairs.¹⁰

⁹ *Ibid.*

¹⁰ *Ibid.*

Structure of DNA

The famous double helix is two intertwined sugar and phosphate chains, linked by four kinds of chemical 'bases' - a, c, g and t - which make up the genetic code

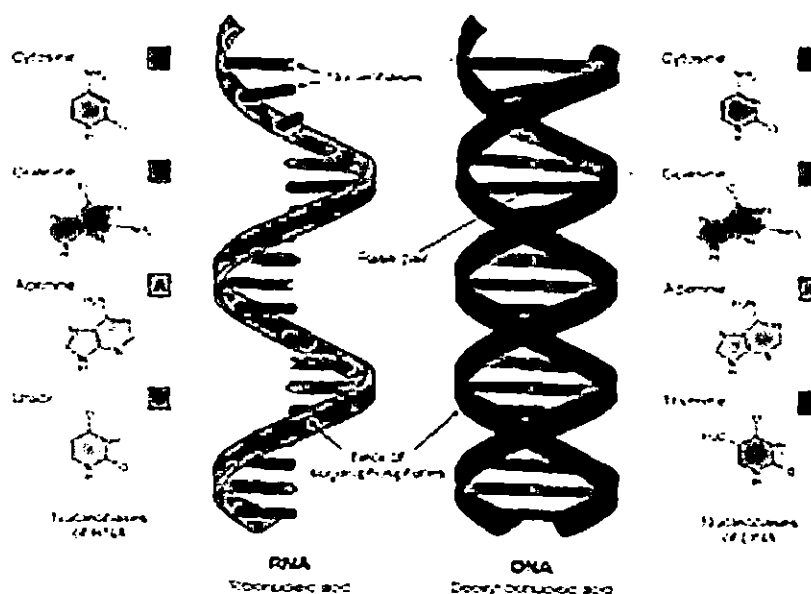


A genome is an organism's entire genetic material. All living organisms contain genetic material or genomes. One of the most commonly accepted definition of gene is that a gene contains all of the information required to determine the expression of a specific protein or chain of amino acid (a polypeptide). Sometimes a polypeptide can form a complete protein on its own (as in the case of insulin), but in most cases a number of polypeptides combine to create a single protein (as in the case of collagen and globin).¹¹ Proteins are critical components of all cells, determining colour, shape and function. Proteins can have a structural role (such as keratin, from which hair is made), or a functional role in regulating the chemical reactions that occur within each cell (such as the enzymes involved in producing energy for the cell). Proteins are themselves made up of a chain of amino acids. Within the DNA there is a code that determines which amino acids will come together to form that particular protein.¹² The genetic code for each amino acid, consisting of three bases, is virtually identical across all living organisms. Different genes are switched on and off in different cells leading to different proteins being made or expressed with varying structures, appearances and functions leading to the production of brain cells, nerve cells, blood cells, and so on. Contemporary stem cell research is based on the idea that it should be possible to learn how to use gene switches to coax stem cells into developing into the specialized cells or tissue needed for therapeutic purposes. When the instructions in a gene are to be read, the DNA comprising that gene unwinds and the two strands of the double helix separate. An enzyme called RNA polymerase

¹¹ *Id.*

¹² *Ibid.*

allows a complimentary copy of one strand of the DNA to be made.¹³ This copy is made from RNA nucleotides, and is called messenger RNA (or mRNA) because it carries the coded genetic information to the protein-producing units in the cell, called ribosome. This process of reading the message in the DNA is called transcription.



Structure of DNA and RNA

In the ribosome, the amino acids are assembled in the precise order coded for in the mRNA. The process of converting the message encoded in the RNA (mRNA) to protein using the ribosome is called translation. When the whole message has been translated, the long chain of amino acids folds itself up into a distinctive shape that depends upon its sequence – and is then known as a protein.¹⁴ Amongst humans, genes comprise only a small proportion of the DNA in a cell. Up to 98% of DNA consists of 'non-coding' regions popularly, but incorrectly, referred to as 'junk DNA' which are full of repeat sequences (micro-satellites), pseudo genes and retroviruses. By way of contrast, there are no non-coding portions of DNA in bacteria there are only genes, each one expressing a specific protein. In recent years, genetic scientists increasingly have come to believe that non-coding DNA may be the basis for the complexity and sophistication of the human genome, which permits only 30,000 or so genes to produce about 200,000 proteins. A pioneer in this field, Professor John Mattick, Director of the Institute for Molecular Biology at the University of Queensland, has surmised that non-coding DNA forms a massive parallel processing system producing secondary signals that integrate and regulate the activity of genes

¹³ *Ibid.*

¹⁴ *Id.*

and proteins. In effect, they co-ordinate complex programmes involved in the development of complex organisms¹⁵.

According to recent estimates¹⁶ all humans have the same basic set of about 30,000 – 35,000 genes, which is far lower than the early estimates of 200,000 (based on the number of proteins), and even the relatively recent estimates of 100,000 used at the start of Human Genome Project. Genes may come in different versions, known as alleles. These alleles arise when there is a change in the ordering of the bases (nucleotides) described above in effect, a 'typographical error' in the code, involving the change of a single letter, the inversion of two letters, the deletion or insertion of a codon or the repetition of a codon. This change in the sequence (a mutation) may cause no harm, merely resulting in a polymorphism, or it may make the gene faulty in the way it directs (expresses) the production of protein. In a very few cases the mutation is beneficial. Although any two human beings are at least 99.9% genetically identical, the precise DNA sequence of about 3.2 billion base pairs will differ slightly in each person's genetic code. The 0.1% of difference is thought to compromise more than 10 million common single letter genetic variations (single nucleotide polymorphisms, or SNPs) as well as a larger number of rare variants. The rate of variation is very low in humans (one SNP per 1,300 bases) compared with other species, including other primates suggesting a population that has descended from a small 'starter population'. This explains both the striking similarities among all people, which are the result of our common inheritance, and the many individual differences found even within a nuclear family.

Mutations are permanent and inheritable changes in the ability of a gene to encode its protein. Much like typographical errors, which can change the meaning of a word, or even render a sentence as gibberish, such changes in gene structure can have severe effects on the ability of a gene to encode its protein. Some mutations prevent any protein from being produced, some produce a non-functional or only partially functional protein, and some produce a faulty or poisonous version of the protein¹⁷.

15 Genetic Science, "Human Health and Gene Patent", A.L.R.C Issue Paper 27 Intellectual Property Rights Over Genetic Material.

16 E. Lander, 'Genomic Information: Driving a Revolution in Bio-Medicine', Paper Presented at 7th International Conference of the Human Genome Organization, Shanghai, 14th April 2002.

17 R.Hawley and C. Mori, *The Human Genome: A User's Guide* 6 (Harcourt Academic Press, Burlington 1999).

The unique combination of alleles found in a particular individual's genetic make-up is said to constitute that person's genotype. The observable physical characteristics of this genotype, as determined by the interaction of both genetic makeup and environmental factors, is said to constitute that person's phenotype. This includes features such as colour of eye and hair, determined genetically, as well as height and weight determined by genetic factors as well as by diet, access to proper healthcare and other environmental influences. Because mutations can affect the functioning and expression of the alleles of genes, resulting in particular traits or characteristics, it is possible to follow the pattern of inheritance of the different alleles of a gene in a family. For most genes, two copies are found in an individual. If the two copies are the same allele, the individual is said to be homozygous. If two different alleles for that gene are present, the individual is referred to as heterozygous for that gene except for those traits coded for by genes that are found on the X chromosome. A dominant trait is the one that is manifested when a person has only one mutated allele in a particular gene pair. An affected person may have inherited the mutated allele from either parent or, as the result of a new mutation, may be the first person in the family to have it. There is one-in-two chance that a child will inherit a genetic trait if one parent has a dominant mutated allele. Examples of autosomal dominant traits include HD, myotonic dystrophy, hereditary non-polyposis colorectal cancer, Marfan syndrome, familial adenomatous polyposis, and early onset familial Alzheimer's disease. Tendency to identify a specific gene as the cause of disease obscures the vital role of genes in human health. Any catalogue of the human genome would disclose the list of diseases giving an impression that genes are there to cause disease. "To define genes by the diseases they cause is about as absurd as defining organs of the body by the diseases they get: livers are there to cause cirrhosis, hearts to cause heart attacks and brains to cause strokes. It is a measure, not of our knowledge but of our ignorance, that this is the way the genome catalogues read. It is literally true that the only thing we know about some genes is that their malfunction causes a particular disease. This is a pitifully small thing to know about a gene, and a terribly misleading one. The sufferers have the mutation, not the gene."¹⁸ Medical conditions or diseases linked to genes can be classified in a number of ways, including: monogenic (or single gene) disorders; polygenic (or multi-gene) disorders;

18 M. Ridley, "Genome: The Autobiography of Species in 23rd Chapter ", (1999), Fourth Estate, London 55.

and multifactorial disorders. A monogenic disorder is one in which a mutation in one or both alleles of a single gene is the main factor in causing a genetic disease. Much of our early understanding about genetic influences on health is derived from the observation and study of monogenic disorders such as Huntington's disease (a neurodegenerative disease which is inherited in an autosomal dominant pattern) – although such diseases are relatively rare. The vast majority of medical conditions with some genetic link involve either the complex interaction of a number of genes (polygenic) or the complex interaction between genes and the environment (multifactorial disorders). In the case of multifactorial disorders, inheriting a mutated allele for a particular condition means that a person is susceptible or predisposed to develop the condition. Other factors such as diet or exposure to certain environmental factors are necessary to bring about the expression of the trait or condition. Most of the important and common medical problems in humans are multifactor, including heart disease, hypertension, psychiatric illness (such as schizophrenia), dementia, diabetes, and cancers. According to the Human Genome Database, as on 29 December 2002, 14,014 genes had been mapped to individual chromosomes, of which 1,639 had been identified as being involved in a genetic disorder. It may be that most of the simple linkages have already been made, since the rate of discovery has slowed dramatically despite better technology; of the last 3,783 genes to have been mapped; only 17 have been identified with a genetic disorder¹⁹.

The arrangement of these bases of the helical structure is in a sequence and the variation in their sequence is different from another species, which helps the scientist to read this sequence and identify the gene and the person. DNA testing represents an extraordinary enhancement in solving many complicated crime relating mysteries with greater accuracies. This test can helps to determine whether a particular patch of blood ,hair and wrapped cloths found from the scene of occurrence of crime or from the body of the criminal or the victim to the belong to the accused person or victim or not. Besides the above sample it can also be detected from the saliva, body fluids, bones, urine, body organs and even from charred damaged mutilated remain of a body²⁰.

¹⁹ *Supra* 8.

²⁰ *Supra* 3,.81.

4.3 Structure of DNA

The structure of DNA varies from individual to individual. DNA structure determines human character, behaviour and body characterisation. Each individual, consequently, is unique, different from all other. In monozygotic twins, DNA structure is same because they come forth by the division of a single fertilized egg. Monozygotic twin are genetically identified.²¹

DNA is a complex molecule. It has a double helix structure, which can be compared with a twisted rope 'ladder'. The runs of the 'ladders are made of two pair of four bodies:²²

- (1) Adenine and Thymine form one pair (and one rung of the ladder) each base emanating from either of the two arms and joining in-between.
- (2) Cytosine and Guanine form the other pair and other rung of the 'ladder'. The bases of one pair do not interchange with the bases of the other pair. The ladder thus formed, is twisted and each twist consists of ten pair – ten runs. One DNA molecule can have lakhs of these pairs.²³
- (3) These are four bases called AGCT by which DNA constituents of DNA are described. Uracil bases are Adenine (A) and Guanine (G). Pyrimidine bases are Cytosine (C) and Thymine (T). According to base pairing "rules of Chargaff" A always pairs with T and G with C by hydrogen bond which is known as "Chargaff law". Uracil and Pyrimidine base are joined with Deoxyribose sugar at 1st carbon position by B-glycoside bond. In this way Nitrogen base and sugar form nucleoside. Nucleoside and phosphate acid join to form nucleotide. DNA can exist as a single – stranded form with two sugar – phosphate backbones.²⁴ Nucleotides are linked serially by phosphate group each linking the C5 and C3 of the pentose of the successive nucleotide.²⁵

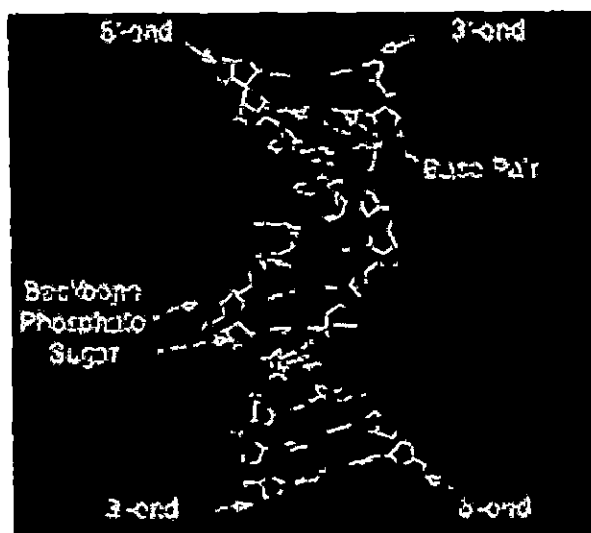
21 Dr. B.R. Sharma, *Forensic Science in Criminal Investigation & Trial* 1123 (Universal Law Publication, IVth edn. 2011).

22 *Ibid.* 1123.

23 *Id.*, 1124.

24 Deepak Ratan and Mohd. Hasan Zaidi, *Forensic Science in India And the World* 108 (Allia Publication, edn. 2008).

25 *Ibid.* 108.



The DNA molecule consists of double chain of nucleotide .One end of each strand is called 5 and the other 3 end .Two strands are always complementary and antiparallel. The two strand of DNA are coiled around a common axis in “plactonemic coiling “manner like a spiral staircase .It is also known as right- handed coiling or clock-wise coiling or dextrose coiling .The dextrose sugar and phosphate group are like the railing and hydrogen bonded base pairs are as the steps and these are backbone of DNA .The attached base pairs are varied in each nucleoside unit.²⁶

4.4 Historical Perspective of DNA

The following is a brief history of DNA discovery, analysis, and testing. The significant advances over the last 140 years that evolved into the DNA testing industry and the paternity testing information available today are discussed as follows:

1865

The theories of heredity are attributed to Gregor Mendel, based on his genetic profiles of pea plants, are well known to any biology student. However, his genetic profiles were so unprecedented at the time; it took almost 34 years for the rest of the scientific community to catch up. The short monograph, *Experiments with Plant Hybrids*, in which Mendel described how traits were inherited, has become one of the most enduring and influential publications in the history of science.

1900

The science of genetics was finally born when Mendel's work was rediscovered by three scientists - Hugo DeVries, Erich Von Tschermak, and Carl

²⁶ Watson J.D. and Crick, F.H.C.on A Molecular Structure for Deoxyribose Nucleic Acid, Edn. 1953.

Correns - each one independently researching scientific literature for precedents to their own "original" work.

1935

Andrei Nikolaevitch Belozersky isolated DNA in the pure state for the first time.

1953

James Watson and Francis Crick proposed the double-stranded, helical, complementary, anti-parallel model for DNA. *Nature* magazine published James Watson's and Francis Crick's manuscript describing the double helical structure of DNA.

1958

Coenberg discovered and isolated DNA polymerase, which became the first enzyme used to make DNA in a test tube.

1966

The genetic code was "cracked". Marshall Nierenberg, Heinrich Mathaei, and Severo Ochoa demonstrated that a sequence of three nucleotide bases (a codon) determines each of 20 amino acids.

1972

The first successful DNA cloning experiments were performed in California.

1973

For the first time, scientists successfully transferred deoxyribonucleic acid (DNA) from one life form into another. Stanley Cohen and Annie Chang of Stanford University and Herbert Boyer of UCSF "spliced" sections of viral DNA and bacterial DNA with the same restriction enzyme, creating a plasmid with dual antibiotic resistance. They then spliced this recombinant DNA molecule into the DNA of a bacterium, thereby producing the first recombinant DNA organism.

1976

The NIH released the first guidelines for recombinant DNA experimentation. The guidelines restricted many categories of experiments.

1978

Studies by David Botstein and others found that when a restrictive enzyme is applied to DNA from different individuals, the resulting sets of fragments sometimes

differ markedly from one person to the next. Such variations in DNA are called restriction fragment length polymorphisms (RFLPs), and they are extremely useful in genetic studies.

1980

Kary Mullis and others at Cetus Corporation in Berkeley, California, invented a technique for multiplying DNA sequences in vitro by, the polymerase chain reaction (PCR). PCR has been called the most revolutionary new technique in molecular biology in the 1980s. Cetus patented the process, and in the summer of 1991 sold the patent to Hoffman-La Roche, Inc. for \$300 million.

1984

Alec Jeffreys introduced technique for DNA fingerprinting to identify individuals.

1985

Genetic fingerprinting entered the court room.

1989

Creation of the National Center for Human Genome Research, headed by James Watson, which will oversee the \$3 billion U.S. effort to map and sequence all human DNA by 2005.

1990

The Human Genome Project, the international effort to map all of the genes in the human body, was launched. Estimated cost: \$13 billion.

1992

The U.S. Army began collecting blood and tissue samples from all new recruits as part of a "genetic dog tag" program aimed at better identification of soldiers killed in combat.

1993

An international research team, led by Daniel Cohen, of the Center for the Study of Human Polymorphisms in Paris, produces a rough map of all 23 pairs of human chromosomes.

1995

Former football player O.J. Simpson was found not guilty in a high-profile double-murder trial in which PCR and DNA fingerprinting play prominent roles.

1997

Researchers at Scotland's Roslin Institute reported that they have cloned a

sheep--named Dolly--from the cell of an adult ewe. Polly, the first sheep cloned by nuclear transfer technology bearing a human gene, appears later. Also, leading geneticists expressed shock and dismay as word spread of the US Patent and Trademark Office announcement that it would allow patents on expressed sequence tags (ESTs), short sequences of human DNA that have proven useful in genome mapping.

1998

A rough draft of the human genome map was produced, showing the locations of more than 30,000 genes.

2000

Scientists announced that they have essentially cracked the human genetic code - a decade-long effort by over 1,000 researchers that could revolutionize the diagnosis and treatment of diseases once considered incurable. Decoding the 3 billion chemical "letters" in human DNA is seen as one of history's great scientific milestones - the biological equivalent of the moon landing²⁷.

4.5 Meaning & concept of DNA Testing

"Today we see enormous changes being brought about by science .The whole context of life is changing. As a matter of fact ,looking back at least half century with which I have been more or less connected and some of you also see that enormous changes have been brought about chiefly by science and technology .This pace of change is growing and I have no doubt that another fifty year or even twenty-five hence , you will see even greater changes not merely in space research ,but something affecting human life ..In order to participate in this movement ,you have to build yourself up in the Science and Technology."

Jawaharlal Nehru

Modern day biology is seeking new and better ways to enhance our quality of life through application of technology (biotechnology) and rapid progress in research on human genome.²⁸ The discovery of the structure of DNA²⁹ (deoxyribonucleic acid)

²⁷ Prophase Genetic –Advancing Science and Service one test at a time, 1-800 DNA- 1840.

²⁸ Genome means genetic material of an organism (gene +chromosomes).

²⁹ It is the self-replication material present in nearly all living organism, especially as a constituent of chromosomes, which is carrier genetic information of the different social condition and prevail and the different historical background and cultural tradition.

in the 1950s, and the recognition that it is virtually the universal genetic material, made it imperative for the man to apply this knowledge towards unexpected ends.

The history of crime has started with the history of civilization. Every society has been enacting laws to combat crimes and criminals since long time. From times-Immemorial, the single quest of any legal system has been the Quest for truth. The phrase Satyamevayajate has assumed sacred proportions as regards to the Indian psyche. Crime is a social and economic phenomenon distressing the whole human community. With sweeping changes in society and in economic activities, the face of crime has also changed. Today the sophisticated technology in the hands of criminals is creating mayhem. The law enforcement agencies need to be a step ahead of the lawbreakers. Forensic science provides investigators or crime fighters that weapon, the most significant being DNA profiling or DNA test. DNA technology is one such tool, which upholds truth.³⁰

The focus of most criminal investigations is on linking the evidence from the crime scene to suspects, and for more than a century, science has played an increasingly important role in this process. Fingerprinting, Genetic engineering, sequence of whole genome (be they of men, animal, plant or microorganism) or exploitation of the differences between the DNA of the male and the female (for example of the X and Y sperm) have thus all been historical imperative.³¹ Fingerprinting was applied to criminal investigation beginning in the 1880's. Shortly after the principle of ABO blood group typing was reported in 1900. Its relevance to forensic investigation became apparent. In the 1960's human leukocyte antigen (HLA) typing became the premier serologic tool for personal identification although in practice, it was useful for only a small percentage of sample. Finally, the 1980's ushered in the age of DNA testing, which permits investigators to perform almost unbelievable feats of identification with current techniques. It is possible for a single person to be differentiated from all the people that have ever lived using DNA from a single hair root. The principles and techniques used for forensic DNA typing are also quit useful for other purpose. DNA profile are widely used in resolving issues of parentage in man and animal, and are rapidly replacing serologic analysis (i.e. blood

30 Article Published in Police Law Journal 86, (2005) .

31 DNA Fingerprinting or profiling llows examination of human biological material at its most fundamental level-the DNA molecule .The molecule is smaller fundamental unit of a chemical compound that can take part in chemical reaction.

typing) for that purpose. Additionally, DNA testing is an indispensable tool for positional cloning, a technique by which a previously unknown gene is identified by finding association or links between DNA markers and the inheritance of a disease.

4.6 History of DNA Testing

A detailed summary of an interactive presentation that follows the history of DNA testing which began in the late 1800s. This timeline includes Mendel's genetic discoveries, many future DNA testing applications, along with interesting paternity cases that have made history.

If one has ever wondered what came between the discovery of eye color inheritance and paternity testing, he would want to follow the history of DNA testing in this flash media presentation created by DNA Diagnostics Center (DDC).

With simple explanations of complex discoveries ranging from Gregor Mendel's discovery of genetics to the most reliable DNA testing today, this interactive presentation is a great guide to the history of DNA testing for students and science enthusiasts of all ages.

One can follow along with history, each decade at a time from the 1890s to the present, and read about famous paternity cases involving high-profile cases like inheritance claims that called for DNA testing.

One such case involves Larry Hillblom, co-founder of a large shipping company, who died in a tragic plane crash in 1995. Women from several countries claimed that Hillblom had fathered their children, and made claims on his estate, estimated to be worth \$90 million. Part of the estate was eventually awarded to four of his biological children, as proven by DNA testing. There are many more famous cases in the presentation, including the recent paternity testing case involving the famous actress/model Anna Nicole Smith³².

First established in 1985 by Sir Alec Jeffrey's, DNA testing has become an increasingly popular method of identification and research. The applications of DNA testing, or DNA fingerprinting within forensic science is often what most people think of when they hear the phrase. Popularized by television and cinema, using DNA to match blood, hair or saliva to criminals is one purpose of testing DNA. It is also

32 "History of DNA", *available at*: [www. Buzzle.Com](http://www.Buzzle.Com).(visited on date 15-06-2010).

frequently used for other benefits, like wildlife studies, paternity testing, body identification, and in studies pertaining to human dispersion.

While most aspects of DNA are identical in samples from all human beings, concentrating on identifying patterns called micro satellites reveals qualities specific and unique to the individual. During the early stages of this science, a DNA test was performed using an analysis called restriction fragment length polymorphism. Because this process was extremely time consuming and required a great deal of DNA, new methods like polymerase chain reaction and amplified fragment length polymorphism have been employed.

The benefits of DNA testing are ample. In 1987, Colin Pitchfork became the first criminal to be caught as a result of DNA testing. The information provided with DNA tests has also helped wrongfully incarcerated people like Gary Dotson and Dennis Halstead reclaim their freedom³³.

Thus it can be said with full attentivity that the invention of DNA Technology has surely revolutionized the crime detection. This technology has been found to be extremely useful in Civil as well as Criminal proceedings.

4.7 Discoveries and Development of DNA Technology- Discoveries in the field of Genetics –

- In 1865, Gregor J. Mandel gave the formula of “Law of Inheritance (In Austria).
- In 1869, Friedrich Miescher discovered DNA (in Switzerland).
- In 1901, Landsteiner developed blood grouping system (In Austria).
- In 1908 Hardy and Weinberg given the Hardy-Weinberg Law (From United Kingdom and Germany).
- In 1944, O.T.Avery mC Carthy and Mcc Leods described that DNA is a genetic material (In USA).
- In 1953, Watson –Crick and Wilkins-Fronklin indicated about double helical structure of DNA (In USA).
- In 1978, Kan and Dozy uses restriction enzymes for the purpose of elucidation of the polymorphism (In USA).

33 DNA Testing at Life Science- Com.htm.(visited on 21-12-2010).

- In 1980, Balestein and White use RFLP technique to investigate Human Genome Mapping (In USA).
- In 1983, K.B. Mullis develop more advanced Polymerase Chain Reaction (PCR) technique (In USA).
- In 1984, Can, Brown and Wilson used mitochondrial DNA RFLP for the purpose of human evolution (In USA).
- In 1992, Edwards, Hammond, Jin, Cakey and Chakraborty developed genetic STR Variation (In USA).³⁴

4.7.1 Discoveries in the field of Forensic Science –

- In 1915, Beam and Feak described about advance blood test (In UK).
- In 1920, Locard gives the ‘principle of Exchange’ (in France).
- In 1966, Harris introduces “human allozymes polymorphism” (In UK).
- In 1980, Faulds described fingerprinting as the first source for individual identification (in Scotland).
- In 1985, Prof. Alec Jefferys developed first Forensic DNA analysis (In UK).
- In 1992, U.S.A had established Stranded of DNA Testing by First Research Council Report.
- In 1993, United States, F.B.I. started investigation working DNA Database (CODIS).
- In 1996, Second National Research Council Report was published in USA.
- In 1998, in United States, 13STR Loci were established for CODIS.
- In 1999, P.E. Bio-System and Promega of United States started multiplex kits marketing for DNA analysis.³⁵

4.7.2 First Uses of DNA evidence for the purpose of Law

- In 1986, Prof. Alec Jeffreys innovated and applied first DNA test of two teenage girl’s rape and murder case in USA.
- In 1987, Robert Melias was the first person got conviction on the basis of DNA evidence in UK.

³⁴ *Supra* 15, 121-122.

³⁵ *Ibid.*

- In 1987, DNA evidence was produced in first time in USA.
- In 1987, DNA test was first used in Tommy Lee Andrew of USA in a rape case.
- In 1989, DNA test had got legal validity in India.
- In 1989, DNA evidence was produced first in the Indian Courts (In Paternity disputed case in Kerala, India).
- In 1994, the 'crime of century' case of O.J.Simpson's case produces in court.
- In 1996, mitochondrial DNA analysis was first used in the case of Tennessee in USA.
- In 1998, Canada has passed DNA Identification Act, 1998 and it is assented in 2000.
- In 2003, USA has passed Advancing Justice through DNA Technology Act, 2003.
- In 2005, in India, provision for DNA Profiling is included in the Code of Criminal Procedure by passing the Code of Criminal Procedure (Amendment) Act, 2005.³⁶

4.8 Various Techniques of DNA Profiling

The aim and of DNA profiling is to detect the differences among DNA samples taken from different individual .DNA profiling uses advanced techniques developed by molecular biologist to 'home in' on the area of DNA where there are differences among individual DNA fingerprinting /profiling techniques is of greatest advantage as it helps in –

- Organ transplantation (in medical science)
- Establishment of biological relationship of two or more person
- Identifying missing children and in cases of child swapping
- Post conviction of DNA testing for exoneration
- To solve the paternity dispute
- To solve the other criminal cases
- The cases of inheritance or succession, adoption, maintenance of minor child, etc. ³⁷

³⁶ *Id.*



Lab for DNA testing

The original technique for performing DNA profiling and one that has been the subject of the most litigation till date is known commonly as Restriction Fragment Length Polymorphism (RELP) analysis. The more advance technique is Polymer Chain Reaction (PCR) technique, Short Tandem repeat (STR), Variable Number of Tandem Repeat (VNTR) technique, etc.

4.8.1 Polymer Chain Reaction-

In 1983 a new technique discovered by KaryMullis has been widely used to amplify a specific DNA fragment without the need of bacterial cell known as PCR.³⁸ The Polymer Chain Reaction is a method by which specific segment of DNA which are of interest, can be replicated a million fold or more, so as to obtain sufficient DNA for analysis .The PCR process is analogous to cellular mechanism for DNA replication. The double stranded DNA extracted from the biological material is dissociated in to single strands by incubation at high temperature .Each strand serves as a template for the replication of their complication of their complimentary sequences .The Polymer Chain Reaction (PCR) based testing method even very small biological evidence can be analyzed .This method replicated exact copies of DNA contained in sample without affecting the original one.³⁹ The PCR process does not perform the work of DNA typing .It only increases the available DNA in a very large quantity and the number of copies can be increased to more than one million within a very short period time .It may be compared to a Xerox machine .But the comparison

³⁷ *Supra* 15, 125.

³⁸ *The Indian Police Journal*, 16(2001).

³⁹ *Supra* 15,139.

is not totally true. In PCR DNA is copied copies and copied and so on .This can be done by Xerox machine .Virtually, PCR is a cloning process in which DNA or its fragment can be replicated and number of time.

CHROMOSOME SHORTENING DURING NORMAL DNA REPLICATION

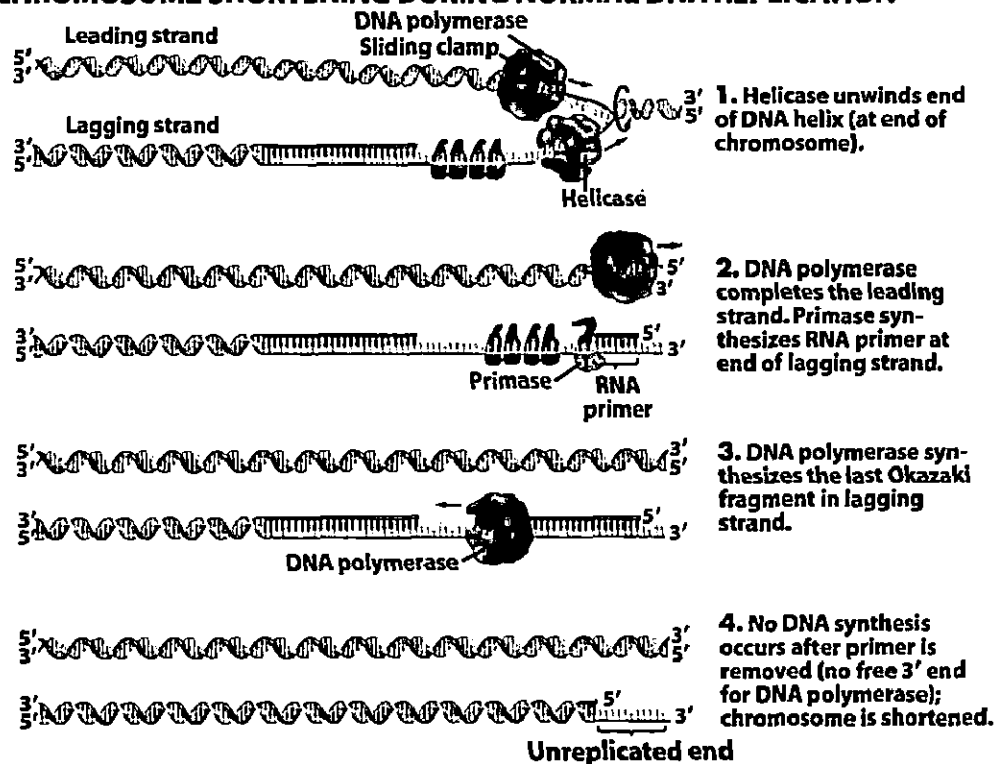
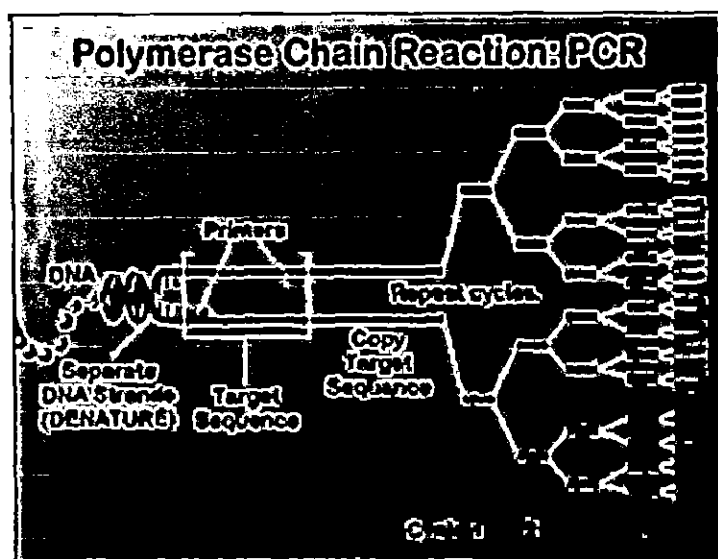


Figure 14-14 Biological Science, 2/e

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PCR is also called Primer Extension Reaction. 'Primer' are those sequences of DNA which "flank" the region to be copied .Primers are the most important component of



Polymer Chain reaction

PCR Reaction .The two other component of PCR are (1) “Template DNA “and (2) “DNA Polymerase”.⁴⁰

4.8.2 Restriction Fragment Length Polymorphism (RFLP)

Restriction Fragment Length Polymorphism analysis was the first Forensic DNA investigation technique which is used to analyze the forensic DNA sample, or evidentiary DNA or biological material to identify the individual .Bostein was the first person who suggested the use of RELP method for mapping the human genome was discovered by Wyman and White .The significant discovery of 20th century, i.e. RELP analysis was introduced by a famous Criminalist Prof. Alec Jeffrey in 1985 while solving the rape-homicide cases of two teenaged school girl and afterwards it was used to detect a serial rapist of a crime in United Kingdom.⁴¹

The technique focuses on the length of the various polymorphic repeated segments located between the common protein genes or coding regions because they have variable number of tandemly repeated (VNTR) units. The length of each of them repeated segments is directly associated to the number of times the sequence of the base pair is repeated .Recognizing and comparing the length of these segment between individual offer a way to discriminate one person’s DNA from another .⁴²

4.8.2.1 Steps of RFLP analysis

The RFLP is a complex procedure that can be subdivided in to different steps which are performed sequentially thus error in any of the steps would invalidate the whole test rendering it inadmissible. These steps as follows-

- (a) Isolation (or extraction) of DNA from biological material;
- (b) Restriction enzymes cutting of DNA;
- (c) Gel electrophoresis;
- (d) Southern blotting;
- (e) Hybridization;
- (f) Visualization of DNA bonding pattern.⁴³

40 Mullis K.B. on The Unusual Origin of PCR, 1990 Ed.

41 Yaspal Singh, Mohd. Hasan Zaidi, *DNA Test in Criminal Investigation, Trial and Criminal Trial and Paternity Dispute (Justice through Science)* 88,(Alia Publication ,edn..2006).

42 Abhijeet Sharma, *Guide to DNA Test in Determination &Criminal Investigation* 88 (edn.. 2007, Forwarded by Hon’ble Justice Arijit Pasayat ,Judge ,SC of India).

43 *Supra* 32, 89.

4.8.2.1 (a) Isolation (or Extraction) of DNA from biological material –

RFLP is a technique for analyzing the variable lengths of DNA fragments that result from digesting a DNA sample with a special kind of enzyme. This enzyme, a restriction endonuclease, cuts DNA at a specific sequence pattern known as a restriction endonuclease recognition site. The presence or absence of certain recognition sites in a DNA sample generates variable lengths of DNA fragments, which are separated using gel electrophoresis. They are then hybridized with DNA probes that bind to a complementary DNA sequence in the sample.

RFLP was one of the first applications of DNA analysis to forensic investigation. With the development of newer, more efficient DNA-analysis techniques, RFLP is not used as much as it once was because it requires relatively large amounts of DNA. In addition, samples degraded by environmental factors, such as dirt or mold, do not work well with RFLP.⁴⁴

At the first stage, DNA is isolated from the biological material submitted as forensic evidence such as blood or semen dried onto a solid surface, such as clothing. The primarily discovered material dried onto some surface which is then washed and DNA is released by treatment with chemical and enzymes. Occasionally, like in the cases of vaginal swabs from rapes, it becomes necessary to separate DNA from different cell type. In cases like them, sperm cells are separated from vaginal cells by centrifugation and differential analysis. Before DNA can be subjected to RFLP analysis, it has to be free of any impurities that might effect the whole RFLP process it is thus cleaned up using enzymes and organic solvent. At this stage, the amount of DNA is determined to ensure that sufficient quantity of DNA in interpretable test result.⁴⁵ The molecular weight is also determined to ensure that the DNA molecule have not been broken into shorter fragment by degradation through age or poor preservation. The quality of the DNA recovered can be easily evaluated by running the DNA 'test-gel. Undigested DNA is run on an agarose gel and stained with ethidium bromide, which causes DNA to be fluorescent under Ultraviolet light. The size of the undigested DNA can be estimated by comparison with DNA molecules of known size, usually known as markers.⁴⁶

44 "Structure of DNA," available at: www.forensic-sciencedna.com (last modified on the date 23-07-2010).

45 *Supra* 32, 10.

46 *Supra* 31, 90.

4.8.2.1 (b) Restriction enzymes cutting of DNA

After isolation and purifying DNA, the polymorphic repeating fragment sought from the rest of the strand. This is done through the special enzyme, which is called 'restriction enzyme'. Restriction enzyme speed up the rate of chemical reaction. Specific restriction enzyme are used to break DNA at specific sites within the molecule⁴⁷ and slide along the helix until they recognize a sequence of base pairs that signal the enzyme to stop sliding. The enzymes then digest i.e. chemically out the DNA molecule at that sites, called a 'restriction sites', acting like molecular scissor, cutting DNA at a specific sequence of base pair.

If a specific restriction site occurs in more than one location on a DNA molecule, a restriction enzyme will make a cut at each of those sites, restricting in multiple fragment of different length⁴⁸.

4.8.2.1 (c) Gel electrophoresis

In this process, DNA fragment are separated on the basis of different of size. In this technique DNA is placed in a slab of agarose gel and then applying an electric current across the gel. DNA is negatively charged molecule so the fragment will move towards the positive electrode when the electric current is turned on, DNA fragments of different size have moved different distance. Long piece of DNA fragments remain near the top of the gel. Whereas short piece are found near the bottom. The movement of bigger DNA fragment become very slow in comparison to small DNA fragment. When the DNA fragment are separated, size of restriction fragment length is determined by their movement in agarose gel. The disintegration of separated DNA fragment start after one or two days.

4.8.2.1 (d) Southern Blotting

In 1970, this technique was originally developed by Edward⁴⁹ Southern. After the separation of DNA Fragment, DNA is transferred and permanently affixed to a nylon membrane by placing the membrane on the gel and soaking them overnight.

⁴⁷ *Ibid.*

⁴⁸ *Supra* 32, 10.

⁴⁹ Southern, Detection of Specific Sequence Among DNA Fragment separated by Gel Electrophoresis, 98 J. Molecular Biology 503 (1975) cf <http://www.ntut.edu.tw/~f10894/PDF/underStanding%20Biotechnology/chap%208-pdf>.

Nylon membrane is used because it has five times more binding capacity to bind up DNA than nitrocellulose membrane.

To covalently binding up of DNA molecules or cross linkage of single stranded DNA molecule (also called as-DNA molecule) to the Nylon membrane .It is treated with ultraviolet light .In this way the nylon membrane bound DNA molecule which called probe \$which become radioactive .After this process it is subjected to Hybridization.⁵⁰

4.8.2.1 (e) Hybridization

After the process of southern transfer the DNA fragment attached to the membrane to identify the different length of the polymorphic fragment .To prevent the labeled probe from binding non-specifically to DNA fragment labeled probe is first prehybridized and then membrane is bathed in a solution containing labeled probe .The probe will recognize and hybridize to the target portion (VNTR)⁵¹ of single –stranded DNA molecule .The blot is mixed up in the concentration of detergent salt and urea with DNA which determines the DNA sequence or locus .The probe can be labeled with radioisotopes (P32 deoxyribonucleotide triphosphate)when this hybridization is over and all the specific polymorphic fragment have been bonded to the detecting probe, the membrane is washed to remove any unused probe molecule.⁵²

4.8.2.1 (f) Visualization of DNA Banding Pattern

The position of the polymorphic DNA can be visualized after they located by the probe through a photographic process, which is known as autoradiography .Autobiography means photographic recording of position of radio-labelled DNA probe on X-ray film. This process is done by covering the membrane with a sheet of unexposed X-rays film and storing this from one to seven days at a very low temperature .The radioactivity of the probes depicts the film at the exact location of the polymorphic fragment sites .The film is then developed and a pattern of bands is visualized each of which represent the location of the polymorphic segment on the membrane. This indicates the DNA fragment length by the distance traveled down the membrane. The band pattern produced depends on the DNA extracted from the

⁵⁰ *Supra* 15, 138.

⁵¹ Variable Number Tandem Repeat.

⁵² *Supra* 15, 138.

forensic sample, and the donor's individualized DNA structure. Every person's DNA sequence is unvarying from cell and thus the pattern per-probe will be the same whether the DNA source is hair, root, WBC (White Blood Cell), sperm cell from semen or any other nucleated cell.

4.8.3 Short tandem repeat Analysis

Short tandem repeat (STR) technique is used to assess specific regions (loci) inside nuclear DNA. Changeability in Short tandem repeat (STR) regions can be applied to differentiate one DNA profile from another. The Federal Bureau of Investigation (FBI) applies a standard set of 13 specific STR regions for CODIS. CODIS is a software program that operates local, state, and national databases of DNA profiles from convicted criminals, unsolved offense scene proof, and missing persons. The unusual view is that two individuals will have the similar 13-loci DNA profile is about one in a billion.⁵³

4.8.4 Mitochondrial DNA Analysis

Mitochondrial DNA analysis (mtDNA) can be applied to observe the Deoxyribonucleic Acid (DNA) from samples that cannot be examined by Restriction Fragment Length Polymorphism (RFLP) or Short tandem repeat (STR). Nuclear DNA must be extracted from samples for use in RFLP, PCR, and STR; however, mtDNA analysis uses DNA extracted from another cellular organelle called a mitochondrion. While older biological samples that lack nucleated cellular material, such as hair, bones, and teeth, cannot be analyzed with STR and RFLP, they can be analyzed with mtDNA. In the investigation of cases that have gone unsolved for many years, mtDNA is extremely valuable.⁵⁴

All mothers have the identical mitochondrial DNA as their children. This is for the reason that the mitochondrion of each new embryo comes from the mother's egg cell. The father's sperm contributes only nuclear DNA. Comparing the mtDNA profile of unidentified remains with the profile of a possible motherly relative can be a significant method in missing-person investigations.

⁵³ "Short tandem repeat" available at: www.lawyersclubindia.com (visited on date 17-04-2012).

⁵⁴ *Ibid.*

4.8.5Y-Chromosome-Analysis

Y-Chromosome is inherited in uni-parental manner through paternal side into all male offspring DNA makers located in non-recombining section of Y-chromosomes (NRY) are inherited from generation to generation without exchange of genetic material between chromosome. Parentage linkage can be traced with Y chromosomes makers. Hence Y chromosomes specific STRs have prove as important tool in a male-specific forensic testing and thus can be utilized to prove relationship in paternity testing , sexual assault cases, historical evidence, missing person identification and helpful in evolutionary study to perform phylogenetic analysis.⁵⁵

Additionally, Y-STR are also use investigation of sexual offence, which sample consist of a mixture of body fluids from different individual and detection of male fraction in male/Female mixture without differential DNA extraction. However, Y-STRs are useful when only distant relation on the parental side is present as donor of reference material.⁵⁶

The Y chromosomes is passed directly from the father to son, so analysis of genetic markers on the Y chromosomes is particularly supportive for tracing connection among males or for analyzing biological proof involving multiple male contributors.⁵⁷

4.8.6 Variable Number of Tandem Repeats (VNTR)

Friedrich Miescher discovered nucleic acid in 1869. He had also isolated Deoxyribo nucleic acid from fish sperm. VNTR was formerly used for DNA fingerprinting by the variation in tandem repeats.

4.9 Relevancy and Feasibility of DNA Testing In Crime Investigation

Deoxyribonucleic Acid (DNA) technique is increasingly very important to make sure correctness and fairness in the criminal justice system. News stories praising the triumphant application of DNA to resolve offence flourish all through the World. For instance, in 1999, New York authorities correlated a man through DNA proof to at least 22 sexual assaults and robberies that had terrorized the city. In 2002,

55 Welton J. H. Tsang, KW and Khan H. (2005), 'Inferring the population of origin of DNA evidence within the UK by Allele specific Hybridization of Y-SNPs', *Forensic Science International*, 152(1):45-53.

56 Tanya chauhan, "Application of DNA Technologies in Forensic Analysis- A Review" *Indian Journal of Criminology and Criminalistic* 114(2009).

57 R. Usharani, "DNA evidence and the court" 1, *Karnataka law Journal* 2 (2008(1)).

have been used in DNA tests were missed during the initial investigation, but found after re-investigation four years later. It's thought that about 2,000 violent crimes could have been solved through DNA tests were it not for the fact that vital DNA evidence had been missed. International Biosciences propose a wide range of DNA tests planned to make available unquestionable reply to emotional queries. "Whether you look for to prove paternity, establish relationship or seek pedigree, for legal definition or peace of mind, one is capable to make available the suitable DNA tests at, professionally and confidentially. Using state of this technique we are able to provide conclusive evidence on time"⁶⁰.

4.10 Importance of DNA testing in Medical Science as well as in Legal Science

The term "Medico legal" comprises the fundamentals of two sister vocations i.e. Medicine and Law. Everyone talks about the law but a small number of persons have the right understanding as to what constitutes law. The normal layman frequently has about as much right information about the law as he has about medicine-or life on Venus. And, unluckily, two professional groups suffer from more ignorance of law and medicine than is good for them: lawyers, at least those who do not constantly deal with medical issues in their legal practice, know very little about the medical profession and its problems; physicians frequently comprehend too little about the law and how it affects them in the practice of their profession. Medico legal experts can provide a link between these two professions for their smooth & effective functioning in a scientific manner. The physician meets the law at every turn. He confronts it when, as the treating doctor, he is subpoenaed as a witness in a personal injury lawsuit; he meets it when his aid is sought as an expert in connection with a claim that another member of his profession has been negligent and when he is faced in his office or clinic by a narcotic addict, a man with a gunshot wound, or a young couple seeking a blood test. He is face-to-face with the law when he is required to render an aggravating array of governmental reports or to preserve physical evidence for the benefit of a law enforcement agency. The physician, in fact, finds a great deal of the law intensely irritating, often because he is not absolutely clear as to its purpose. The following subjects deal with all the above aspects of Law and medicine.

60 Gwendolyn Carr; K.D. 2007, North Western University, School of Law.

- Forensic Medicine
- Medical Jurisprudence
- Toxicology⁶¹

Benefits of Medical Jurisprudence:

The introduction of the medical jurisprudence has immensely benefited both the medical and the legal field of work. A better understanding and cooperation has resulted and has facilitated a smoother working of both disciplines. Previously unsolvable cases are now solved with ease with the development of the field of medical jurisprudence. It covers in its ambit the provision of evidence for a wide range and scope of cases. It can be used to determine the Paternity of a child and also be employed in determining the identity of human bodies, which have been mutilated beyond recognition in accidents like bomb blasts, factory explosions etc. In the field of Evidence Laws, it can be appropriated to solve cases involving murders, rapes etc. Medical jurisprudence techniques like autopsy can also be employed to discover important facts vital to the case after the person has died. However, despite their vast benefits to the field of law, medical jurisprudential techniques are not treated as primary evidence till date. The present Indian Evidence Act continues to treat technical findings, such as the results of DNA tests, as expert evidence. This situation will continue till legislation is drafted and enacted by the Parliament. Under Section 45 of the Indian Evidence Act, 1872, it has been, *inter alia*, provided that, when the court has to form an opinion upon a point of science, or art, or as to identity of handwriting or finger impression, the opinions on the point of science, of such persons who are specially skilled in science or art or any question as to identity of handwriting or finger impressions are relevant facts and such persons are called experts. The expression opinion upon a point of science of persons especially skilled in science is capable of application to all future advances in science which enable an expert opinion on a particular point. Due to the heavy misuse and lack of knowledge of the courts as regards the scientific evidence, they are hesitant in applying these techniques. In order to determine whether scientific evidence is admissible, the court may consider-

- (1) Whether the principle or technique has been or can be reliably tested,

61 "Significance of DNA" *available at*: legalcellforall.blogspot.com (last modified on 23,july 20012).

- (2) Whether it has been subjected to peer review or publication,
- (3) Its known or potential rate of error,
- (4) Whether there are standards or organizations controlling the procedures of the technique,
- (5) Whether it is generally accepted by the community, and
- (6) Whether the technique was created or conducted independently of the litigation.

The situation appears hearty only as regards autopsy reports, which have been given the status of documentary evidence under the Indian Evidence Act. The merit attached to them, however, remains subjective and varies from case to case. The complete benefit of these medical jurisprudential techniques can be enjoyed only by an enactment recognizing these techniques as primary evidence, giving it the credit it deserves.⁶²

4.10.1 Importance of DNA Testing In Medical Science

Medical jurisprudence is the application of medical science to legal problems. It is typically involved in cases concerning blood relationship, mental illness, injury, or death resulting from violence. Autopsy is often used to determine the cause of death, particularly in cases where foul play is suspected. Post-mortem examination can determine not only the immediate agent of death (e.g. gunshot wound, poison), but may also yield important contextual information, such as how long the person has been dead, which can help trace the killing. Forensic medicine has also become increasingly important in cases involving rapes. Modern techniques use such specimens as semen, blood, and hair samples of the criminals, found in the victim's bodies, which can be compared to the defendant's genetic makeup through a technique known as DNA fingerprinting; this technique may also be used to identify the body of a victim. The establishment of serious mental illness by a licensed psychologist can be used in demonstrating the incompetence to stand trial, a technique which may be used in the insanity defense, albeit infrequently.

⁶² *Ibid.*

4.10.2 Autopsy:

The systematic testing of a body for finding the reason of death is known as autopsy. In autopsy specially trained physician performed operation on a dead body. The basic object of autopsy is find out the actual cause of death and his health condition during his life. Autopsy is also known as post-mortem. It is perform only after taking the consent of the authorities in case of serious death cases and in other circumstances it perform only with the consent of the family members or with the consent of the deceased person before death. During post-mortem the non human tissue should be identified and discarded. The basic purpose of this testing is to acquire the tissue and organs for transplantation. With the help of autopsy, the cause of death is ascertained. In this test, pieces of scalp, skin, jaw, joint, spine, etc can be helpful to establish the number of the victim. Usually, the post-mortem is only done when there is some doubt regarding the reason of death etc. Post-mortem cannot be completed unless all parts of body are examined in detail. Valuable medical information can be learned from a post-mortem examination. Legionnaire's disease was discovered as a consequence of autopsies, and improved safety standards have resulted from the examination of the bodies of crash victims. The autopsy deal with the particular illness as proved in one individual and is more than simply a statistical average.⁶³ Each autopsy is significant to expose errors, to set the limits of innovative diseases and innovative patterns of disease, and to guide future studies. Morbidity and mortality statistics obtain correctness and importance when based on careful autopsies. The first step is a gross examination of the exterior for any deformity or trauma and an attentive description of the interior of the body and its organs. This is generally followed by additional studies, including microscopic examination of cells and tissues. Then the pathologist proceeds to the dissection, which consists of removing and examining carefully all the parts of the body.⁶⁴

4.10.3 DNA Fingerprinting:

The concept of DNA fingerprinting was introduced by Prof. Alec Jefferys in 1985 and general public has become more familiar with the power of DNA typing. Dr. Jefferys found that were repeated over the again next to each other which are

63 "Autopsy in Field of Forensic Science" *available at:* legalcellforall.blogspot.com (Visited on date 27-12-2013)

64 Ibid.

referred as VNTR. It was also found by him that the number of repeated sequences present in a sample could differ from individual to individual. It is considered as the most powerful tool to identify an individual. Earlier an individual was identified using some conventional techniques like ABO, MNS, Rh. Etc., blood group and serum protein etc but now DNA finger printing is preferred because DNA is much more resistant to the degradation caused by the environment condition. Moreover, DNA is somatically stable. This uniqueness of DNA forms the basis of DNA Fingerprinting which is based on Mendelian law of inheritance.⁶⁵

DNA fingerprinting profiles are unique to each person. It is used for analysing and comparing DNA from different sources and to recognize the suspect from blood, semen, hair or other biological material which found on crime scene.⁶⁶ DNA fingerprinting is also useful in cases of exchange of babies, rapes murder, assassination, dispute related with inheritance etc. After the development of DNA fingerprinting technique, the success rate of solving the case has been considerably increased. After the discovery of DNA fingerprinting many case laws relating with rape has been solved by the various courts in India.

It depends on the fact that no two people, except identical twins, have accurately the identical DNA sequence, and that although only limited part of a person's DNA are analysed in the process, those parts will be statistically unique. The DNA samples of the offender can be obtained from the scene of crime itself. For instance blood samples from a scene of murder or samples of seminal fluids deposits on the clothes or furniture or in the body of the rape victim can be used to obtain a sample of the offender DNA. These samples can be matched with those taken from a possible suspect in the case. DNA evidence, apart from its use in criminal law to determine the killer or the rapist, is also employed for various other purposes. Amongst its varied applications, Paternity testing, Personal recognition, study of the evolution of the human population and study of inherited diseases like Alzheimer's disease etc. are included. After the discovery and use of DNA proof technique the success rate in solving difficult cases in Criminal Law has very much increased. The

65 Ramesh Chandra, *Forensic Science and crime investigation* 3(Abhijeet Publication ,New Delhi, 2005).

66 Modi's *medical jurisprudence and toxicology* 337(Lexis Nexis, Butterworth publication, new Delhi,2008).

DNA evidence is undertaken by matching the DNA from the crime scene with DNA of suspects. These steps are involved in the -

- Collection of DNA at the crime scene and from the suspect.
- Analysing the DNA to create a DNA profile.
- Compare the profile to each other.⁶⁷

The introduction of DNA evidence in the field of Criminal law has particularly facilitated convictions in the matters involving the offence of Rape. In the earlier time it was only the circumstantial evidence which was based upon viable method of solving the rape related crime. It was extremely difficult for the victim of rape to establish the crime by any other means in the absence of circumstantial proof.

From the time of the beginning of the DNA proof, this has been greatly simplified. The investigating officer examined the primary samples of the seminal fluids which found at the crime scene. If this is unavailable, then samples of the seminal fluid are extracted from the victim's body itself. The DNA from this sample is then matched with the DNA sample taken from the accused. If it is proved by the report that these samples match, then this acts as strong proof in the court for establishing rape. As regards the offence of murder, DNA samples that are gathered from the blood, mucous, saliva, skin; hair samples etc, which found on the offence site are applied to extract the DNA sample. DNA testing should be viewed against the fact that the growing citizen concern over crime is not merely about mounting statistics. It is also over the detectives' inability to solve many gruesome crimes. Thus, this unique method becomes very effective to find out the offender. Regarding the authenticity of this modern DNA technique one of the most pertinent queries often made is regarding the handling of this type of technique by the police officer and law enforcement agencies in the process of crime investigation. It is mainly in this context that many critics of police performance raise the issue of DNA profiling frequently.⁶⁸ Apart from its use to nail the culprit, Post-conviction DNA Testing is also a very effective method to exonerate the innocent. The sophisticated technology makes it possible to obtain conclusive results in cases in which the previous testing had been inconclusive. Post-conviction testing will be requested not only in cases in which the DNA testing was never done but also in cases in which more refined technology may

⁶⁷ R. Usharani, "DNA evidence and the court"1, Karnataka law Journal 2 (2008(1)).

⁶⁸ DNA Fingerprinting available at www.legalservice.com(visited on date 14-07 2012)

result in an indisputable answer. The remarkable feature of DNA is that individuals leave at least its traces almost everywhere. A few of the everyday objects handled by us, such as pens, telephones, mugs and keys are some of the things that require attention from a crime investigator. A variety of offences such as murder, rape, armed robbery; extortion and drug trafficking yield themselves to the application of DNA collection and testing. According to a study by the National Institute of Justice (NIJ) of the United States' Justice Department, there are many unusual sources of DNA evidence that need to be explored by an investigator. These include saliva found on the flap of an envelope containing a threat letter, spittle collected from the sidewalk where a suspect in a sexual assault case was under surveillance and blood collected from a bullet that had injured an assailant himself in a case of murder. Collection of samples at a scene of crime requires some skill and observance of basic rules of hygiene. There are two dangers here. One is that, as in the case of hand fingerprints, there is a distinct possibility of several persons having left their DNA behind in a scene of crime. The need, therefore, is to identify all visitors and collecting their samples also (apart from those of the victim/suspect). This assiduous process can try an officer's patience. Secondly, DNA samples are extremely susceptible to contamination. It is essential that the technicians collecting the sample adopt all precautions that a surgeon would while performing a critical surgery. Any slackness could render the entire operation wasteful and susceptible to easy picking of holes by the defense counsel during a trial. Medical jurisprudence is the application of medical science to legal problems. It is typically involved in cases concerning blood relationship, mental illness, injury, or death resulting from violence. Autopsy is often used to determine the cause of death, particularly in cases where foul play is suspected.⁶⁹ Post-mortem examination can determine not only the immediate agent of death (e.g. gunshot wound, poison), but may also yield important contextual information, such as how long the person has been dead, which can help trace the killing. Forensic medicine has also become increasingly important in cases involving rape. Modern techniques use such specimens as semen, blood, and hair samples of the criminal found in the victim's bodies, which can be compared to the defendant's genetic makeup through a technique known as DNA fingerprinting; this technique may also be used to identify the body of a victim. The establishment of serious mental

69 Id.

illness by a licensed psychologist can be used in demonstrating incompetence to stand trial, a technique which may be used in the insanity defense, albeit infrequently.⁷⁰

4.10.4 Genetic fingerprints

Genes are organised into chromosomes and it is through chromosomes that genetic information is transmitted. Genetic technology can be of great benefit to people. However, one of the most dangerous aspect of new technology is the danger to the genetic information becoming available to people who might be involved in making decision that effect every aspect of our lives, especially employer and health insurance company.⁷¹ Chromosomes are paired, and are made of deoxyribonucleic acid, often called DNA. It is the DNA which carries the “blueprint” (genes) from which “building orders” are obtained to direct the growth, maintenance, and activities that go on within our bodies. Except for identical twins, no two people have the same DNA. However, we all belong to the same species; consequently, large strands of DNA are the same in all of us. The segments that are different among us are often referred to as junk DNA by the biologists. It is these unique strands of DNA that are used by forensic scientists. Strands of DNA can be extracted from the cells and “cut” into shorter sections using enzymes. Through chemical techniques involving electrophoresis, radioactive DNA, and x-rays, a characteristic pattern can be established so-called genetic fingerprint. Because different people have different junk DNA, the prints obtained from different people will vary considerably; If there is a match between DNA extracted from semen found on the body of a rape victim and the DNA obtained from a rape suspect’s blood, the match is very convincing evidence-evidence that may well lead to a conviction .Although genetic fingerprinting can provide incriminating evidence, DNA analysis is not always possible because the amount of DNA extracted may not be sufficient for testing. Furthermore, there has been considerable controversy about the use of DNA, the statistical nature of the evidence it offers, and the validity of the testing. Genetic fingerprinting is not limited to DNA obtained from humans. In Arizona, a homicide detective found two seed pods from a palavered tree in the bed of a pickup truck owned by a man accused of murdering a young woman and disposing of her body. The accused man admitted giving the woman a ride in his truck but denied ever having been near the factory

⁷⁰ Scope of DNA Profiling *available at* www.yahoo.com (visited on date 10-12- 2010).

⁷¹ Subhra Chandra Singh, “Protection of human genetic information: Balancing interest in the use of personal genetic data”55:2, Indian Journal of Indian Law Institute 174 (2013).

where her body was found. The detective, after noting a scrape on a palavered tree near the factory, surmised that it was caused by the accused man's truck. Using RAPD (Randomly Amplified Polymorphic DNA) markers—a technique developed by Du Pont scientists—forensic scientists were able to show that the seed pods found in the truck must have come from the scraped tree at the factory. DNA analysis is thus relatively new tool for forensic scientists, but already it has been used to free a number of people who were unjustly sent to prison for crimes that genetic fingerprinting has shown they could not have committed. Despite its success in freeing victims who were unfairly wrongfully convicted, many defense lawyers claim that the prosecutors have overestimated the value of DNA testing in identifying the defendants. They argue that because analysis of DNA molecules involves only a fraction of the DNA, a match does not establish the guilt, but only a probability of guilt. They also contend that there is a lack of quality control standards among laboratories, most of them private, where DNA testing is conducted. Lack of such controls, they argue, leads to so many errors in testing as to invalidate any statistical evidence. Many law officials argue that DNA analysis can provide statistical evidence.⁷²

4.10.5 Gene Patents

Genetic Science and related technologies are important in medical research and in the development and provision of healthcare, and, their significance for human health is likely to increase as more becomes known about the biological functions of genes and the proteins they produce. The patentability of genetic material such as DNA sequence is an intricate and complex issue. The source or raw material for gene patent is human tissue, and some ethics claim that patent should not be given for human material.⁷³

Human genetic research aims to enhance understanding of how genes and environmental factors operate and interact to influence the health of individuals and populations – and in so doing, to generate knowledge with the potential to improve individual and community health. Human genetic research may translate into the development and provision of new forms of healthcare involving, among other things,

72 Conference on “Impact of New Biology on Justice Delivery System: Issue Relating to DNA Fingerprinting, Intellectual Property Rights and Ethical Legal Social Implication “.

73 N. Hettinger's patenting life: Biotechnology, Intellectual Property and Environmental Ethics; 22 Boston college, Environmental Affair Law Review 267 (1995).

medical genetic testing, pharmaco-genetics, gene therapy, and the use of therapeutic proteins or stem cells. There are many ways in which the potential subject matter of gene patents might usefully be categorized. The potential subject matter of gene patents can be grouped into the following four broad categories:-

- (i) Genetic technologies – The methods and items used in genetic research and genetics – based healthcare, including those used in sequencing DNA, medical genetic testing, other diagnostic uses and gene therapy;
- (ii) Natural genetic materials – These are the forms of genetic materials in their natural state, including DNA, RNA, genes and chromosomes;
- (iii) Isolated genetic materials – These are the forms of genetic material isolated from nature, including genetic materials of whole genomes, single genes and gene fragments;
- (iv) Genetic products – these are the item produced by the use of genetic materials, including proteins, nucleic acid probes, nucleic acid constructs such as vectors and plasmids, and anti-sense DNA.⁷⁴

Patenting of new and improved genetic technologies would ordinarily be the least controversial area of gene patenting, since the issues of “invention”, “novelty” and “usefulness” is clearer than they are in case of patents over genetic materials. There is a distinction between a gene or a gene fragment in situ i.e. in the human body or another organism and a gene or gene fragment that has been extracted from the body by a process of isolation and purification. In general, raw products of nature are not patentable. DNA products usually become patentable when they have been isolated, purified, or modified to produce a unique form not found in nature.⁷⁵ The validity and scope of patent protection in the human genome is a question demanding a separate study. But the issue of gene patentability is analogous to the question of ownership of an individual’s genetic information can best be protected by law that treat genetic information as a kind of private property and not through a privacy regime. Gene tic information can be protected by as personal property in many ways including as quasi property, as “jura in re propria”⁷⁶ or what it may be called “quasi in

⁷⁴ 5 ALRC Issue Paper 27, *Intellectual Property Rights over Genetic Materials*, 2001.

⁷⁵ *Human Genome Project*, “Patenting Genes, Gene Fragments, SNPs, Gene Dates: OCTOBER 3-5, 2003 Test, Proteins and Stem Cells, U.S. Department of Energy”, 17th June 2003.

⁷⁶ Black law Dictionary 1253(8th Edition, 2004).

rem property. Genetic information is best protected as tangy non possent- an incorporeal thing – the subject matter of a right within the sphere of proprietary or valuable rights.⁷⁷

4.10.6 DNA Parentage Testing

Parentage testing refers to testing done to confirm or deny biological parentage of a particular child or individual. Such testing may be conducted by blood group or DNA analysis. DNA parentage testing may exclude a person as the biological parent of a child with certainty but it cannot prove absolutely that a person is the child's biological parent. The test result can, however, provide a probability that a person is the biological parent of a child and, if that probability is sufficiently high, an inference of parentage may be confidently drawn.⁷⁸

Parentage testing is the relationship testing and requires participation of two, sometimes three individuals in order to reveal useful information about the biological relationship between those persons. The context in which outcome of parentage testing is revealed is often highly emotionally charged. Where parentage has been misattributed, there may arise issues of “betrayal, revenge, truth and the search for resolution” for many years. This raises the question whether law should emphasize biological parentage over social parentage in matters of parental responsibility, guardianship and maintenance, succession and so on.

To determine child's parentage, there is a statutory presumptions, such as, under Section 112 of the Indian Evidence Act, that the fact that any person was born during the continuance of a valid marriage between his / her mother and any man, or within two hundred and eighty days after its dissolution, the mother remaining unmarried, shall be conclusive proof that he is the legitimate child of that man, unless it can be shown that the parties had no access to each other at any time when that child could have been begotten.⁷⁹

DNA parentage testing may thus be used to rebut a presumption arising under the Act, or to establish evidence in the circumstances where no presumption arises. A man might seek DNA parentage testing in order to obtain evidence of non-paternity for the purpose of civil proceedings against the child's mother to prove “paternity

⁷⁷ *Id.*

⁷⁸ *ALRC Discussion Paper66– Protection of Human Genetic Information– DNA Parentage Testing.*

⁷⁹ *Ibid.*

fraud” and claim damages for emotional stress and financial loss that he suffered due to such fraud. DNA parentage testing may provide evidence to show that a person has a biological connection with a deceased person and can be a proof in support of a succession claim. In mass disasters, such as, aeroplane crashes and the famous World Trade Centre type collapses, DNA parentage and relationship testing is increasingly used in identifying human remains where the body of the deceased is no longer recognizable.⁸⁰

The scientific accuracy of parentage testing is of vital importance, whether it is conducted by accredited or unaccredited laboratories. In a case where the family court ordered a man to undergo DNA parentage testing in relation to a child of whom he claimed to have no knowledge, the test result disclosed a 98.5% probability that he was the father of the child and was required to pay maintenance for the child.⁸¹ But years later, the man’s brother admitted having had a relationship with the child’s mother, and parentage testing showed a 99.5% probability that the brother was the child’s father.⁸² Thus, the social, psychological and economic consequences of unreliable testing point towards an imperative need to maintain the highest technical, scientific and professional standards in conducting parentage testing.⁸³ It is suggested that parentage testing be done under supervision of courts to ensure both the accuracy and reliability of the evidence admitted. Possibility of ‘DNA fraud’ by laboratory staff in such tests is a matter of grave concern and there should be a proper mechanism to address issues arising from the test results and for safeguarding and protecting the integrity of samples against tampering or deliberate fraud. The option of using court supervision would make parentage testing subject to a court order and would enable the courts to provide independent oversight of testing, including in relation to the validity of consent.⁸⁴

The question of disputed paternity or maternity may arise in the following circumstances-

⁸⁰ *Supra* 4.

⁸¹ Dr. A.K. Srivastava”DNA Testing and Human Rights” IV CRLJ 82(2007).

⁸² *This case was reported in G. Bearup, “The Doubt about Dad”, The Good Weekend (The Sydney Morning Herald), 3rd November 2001, 16, 20, and is referred in paragraph 31.42 of the ALRC Discussion Paper 66.*

⁸³ Vipul Dharmani,”DNA technology and its perspective “available at <http://symlaw.ac.in>(visited on date 03-09-2011).

⁸⁴ Hardik Mehata and Rahul Desai,”Relevance of DNA as evidence from Indian perspective”2Gujarat Law Herald 21(2009).

- Alleged adultery and suits for nullity of marriage: when the child is born in lawful wedlock and the husband denies that he is not the father of the child and seeks divorce on this ground.
- Black mailing: when a child is born out of lawful wedlock and the mother accuses a certain man as the father of the child but the man denies the accusation.
- Suits for maintenance of illegitimate children.
- When there has been an allegation of interchanged of a child with another in the maternity home or hospital.
- In the case of kidnapped child, where the women who has kidnapped the child claims to be the mother she may name a friend as alleged father.
- In case supposition child, when a women pretend pregnancy and delivery and forth a suppositious child to pass it off as her own.⁸⁵

4.11 DNA testing Importance of in Legal Science

Advancement in science now provides law enforcement agencies with an unparalleled opportunity to conclusively identify those suspected of having committed the crime. DNA and other forensic testing have revolutionized investigation of crime in just 5 years. DNA, the common abbreviation for deoxyribonucleic acid is used with increasing frequency in the criminal justice system to determine the guilt or innocence. Improvement of DNA testing have also provided a powerful tool to the law enforcement to link suspect even to very old murders, provided that DNA evidence has been properly preserved.⁸⁶

In 1992, Barry Scheck and Peter Neufeld the Innocence Project at the Benjamin N. Cardozo School of Law⁸⁷. The project is a non profits law clinic that handles cases in which post conviction DNA testing of evidence can yield conclusive proof of innocence. As of June 2002, 100 people have been exonerated.⁸⁸ As a result

85 Kishan Vjj and Rajesh Biswas, Basic DNA and Evidentiary issue”37(Jaypee Brother Medical Publisher (P) Ltd, New Delhi, 2004).

86 Document prepared by Honorable Mr. Justice R.K.Abichandani, Justice R. K. Abhichandani, Judge, High Court of Gujarat “*The Gene Age – A Legal Perspective*,” Dates: OCTOBER 3-5, 2003.

87 *Actual Innocence by Scheck, Neufeld, and Dwyer*.

88 *As average of 7 years in prison was served by each exonerated prisoner identified in the 1996 government study titled “Convicted by Juries, Exonerated by Science “.*

of this work, new Innocence Projects were created throughout the United States and now form an Innocence Network.

As of June 2002, 100 people have been exonerated from death row, and DNA has played a substantial role in exoneration in 11 of these cases⁸⁹. This prompted a trend for individual states to legislate post conviction DNA test for prisoners making claims of innocence. Some statutes apply only to the inmates on death row. Others enacted statutes requiring post conviction DNA tests for all convicted prisoners. However, these statutes are very restricted. After reading the 1966 government study titled "Convicted by Juries, Exonerated by Science," the Attorney General directed the National Institute of Justice to establish the National Commission on the Future of DNA Evidence to provide recommendations for post conviction testing.

Since reinstatement of the death penalty in 1976, more than 765 people have been executed in the United States. The Innocence Protection Act of 2001 introduced in the Senate and House of Representatives will reduce the risk of wrongful convictions in capital cases. If passed, the bill will expand access to post conviction DNA testing and to establish federal standards in capital cases. It will make DNA testing available to the federal and state prisoners in capital and non capital cases, but with significant limitations.⁹⁰

4.11.1 Forensic DNA in Non criminal Cases

- (a) **Paternity Cases-** Forensic DNA tests identical to those used in criminal cases are also used in paternity testing. Some of the commercial forensic laboratories that perform testing in criminal cases also perform paternity testing. The State courts rely on paternity testing to determine child support obligations.
- (b) Questions may arise in immigration cases, particularly when immigrants claim family relationships to United States citizens. DNA tests to prove these biological relationships are recognized by the U.S. Immigration and Naturalization Service and by immigration courts.
- (c) **Identification of Decedents-** Forensic DNA typing has long been used by AFDIL to identify the remains of war death. Using mitochondrial DNA testing,

90 H.R. 912 and S. , 486 Legislative Session.

the U.S. Armed Forces has identified the remains of soldiers from World War I, World War II, the Korean War, and Vietnam.

DNA typing is invaluable in mass disasters such as plane crashes. On September 11, 2001, the World Trade Centre in New York was destroyed when two jets high jacked by terrorists deliberately crashed into both the towers and killed thousand people. To identify the victim's forensic DNA tests compared profiles of recovered bodies or body parts with profiles of victims' personal items, such as toothbrushes and hairbrushes.

Several companies, private research institutes, and universities are working on programs employing new electronic DNA analysis technologies. These automated techniques are often developed in non-forensic fields, such as medical research, genetics, or biochemistry. Only after a time of hatching and incubation will the new technologies are sufficiently person to be reliable and widely accepted to permit forensic application.⁹¹

DNA analysis is after all, used in medical identification and in the identification of disaster victims. Thus it is acceptable in these applications and it is acceptable in forensic applications as a good science.

The history of crime emanates with the history of civilization. Every society has been enacting laws to combat crimes and criminals since time immemorial; the single quest of any legal system has been the "quest for truth".

Crime is a social and economic phenomenon distressing the whole human community. With sweeping changes in society and economic activities, the face and methodology of committing crime has also altered. Today, the sophisticated technology in the hands of criminals is creating mayhem. Thus the law enforcement agencies need to be a step ahead of the lawbreakers. Forensic science provides investigators or crime fighters that strong weapon, the most significant being DNA profiling or DNA technology to be one such tool, which upholds truth. DNA is an abbreviation of Deoxyribo Nucleic Acid, which is an organic substance, found in every cell and gives an individual a personal genetic blue print. It can be extracted from a whole variety of different materials like, blood, saliva, semen, hair, urine, body

91 H. James, and J. Nordby Stuard, *Forensic Science- An Introduction to Scientific & Investigation Techniques* 45,(2005).

fluids, bones, body organs etc.⁹² DNA was infact discovered in 1869 by a Swiss scientist Frederick Micscher⁹³, while Sir Alec. J. Jefferys discovered the use of DNA for forensic analysis in 1984 in England first used by the police in the famous Enderby case involving two girls who had been raped and murdered⁹⁴. Since then, different techniques have been developed by scientists, from time to time, the first being Restriction Fragment Length Polymerase or RFLP. Later, Polymerase chain reaction technique (PCR) was developed which has a great advantage over RFLP, and later on it takes lesser number of samples and replicates them manifolds. It is much quicker and cost effective. It also analyzes highly degraded samples and therefore it is the most widely followed method of DNA profiling. The various other methods of DNA profiling are short Tandem Repeat (STR) technology, Mitochondrial DNA analysis (MtDNA) and Y-Chromosome analysis⁹⁵. DNA tests are highly effective because every person's DNA is unique except identical twins. The probability of DNA being same is about 1 in 3 billion.⁹⁶ The greatest asset of DNA is that it is so specific to every individual that it cannot be tampered. DNA test can be used to establish parentage of a child, detect crimes, and identify mutilated dead corpses. They are of immense help in criminal justice administration and in some civil disputes like succession, inheritance etc.

The *raison d'être* under the Indian Evidence Act of 1872 is against the illegitimacy of a child and the public policy that no child should suffer due to laches or lapses on the part of their parents. It is well established that when certain fact is considered as conclusive proof of another fact, the judiciary generally disables the party in disrupting such proof. The only exception occurs when the party contesting paternity shows that there was no access to the other party at the time when the conception of the child could have happened. Wherever paternity is contested, the burden of proof is on the party who pleads negative.⁹⁷ Indian Courts have time and again held that the evidence for proving non-access must be strong, distinct,

92 *Supra* 12, 6.

93 <http://www.DNAsource.com/archives> at 18th Apr. 2011.

94 [http://www.le.ac.uk/bulletin/bulletin may 97. pdf](http://www.le.ac.uk/bulletin/bulletin%20may%2097.pdf) at 18th Apr. 2011.

95 <http://www.library.thinkquest.org> at 18 Apr.2011.

96 Ian freckled and Mendelson Danuta, *Causation in Law and Medicine*, 417, (1st Edn. 2002).

97 Sec .4 of evidence act 1872 which says, when one act is declared by this act to be conclusive proof of another the court shall, on proof of the one fact, regard the other as proved, and shall not allow evidence to be given for the purpose of disapproving it 65, Sarkar on evidence (Central Law Publication, Allahabad, 14th Edn.).

satisfactory and conclusive⁹⁸. DNA test can be strong evidence as they are correct up to 99% if positive and 100% if negative. In the case of **Gautam Kundu vs. State of West Bengal**⁹⁹ the Apex Court has laid down certain guidelines regarding DNA tests and their admissibility to prove parentage-

- (1) That Courts in India cannot order blood test as a matter of course.
- (2) Whenever applications are made for such prayers in order to have roving inquiry, the prayer for blood test cannot be entertained.
- (3) There must be a strong prima facie case that the husband must establish non-access in order to dispel the presumption arising under section 112 of the Indian Evidence Act.
- (4) The Court must carefully examine as to what would be the consequence of ordering the blood test; whether it will have the effect of branding a child as a bastard and the mother as an unchaste woman.
- (5) No one can be compelled to give sample of blood for analysis.

Further the court said Blood-grouping test is a useful test to determine the question of disputed paternity. It can be relied upon by the courts as a circumstantial evidence, which ultimately excludes certain individual as a father of the child. However, it requires to be carefully noted that no person can be compelled to give sample of blood for analysis against his/her will and no adverse inference can be drawn against him/her for this refusal.

Later in the case of **Kanti Devi v. Poshi Ram**¹⁰⁰ the Supreme Court held that even a DNA test that indicated that the respondent was not the father of the child would not be enough to rebut the conclusiveness of the marriage as proof of legitimacy of the child. The Court held that the only way of rebutting the conclusive proof would be to adduce evidence of non-access.¹⁰¹ Justice K.T. Thomas while delivering the judgment said, "The result of a genuine DNA test is said to be scientifically accurate. But even that is not enough to escape from the conclusiveness of Section 112 of the Act e.g. if a husband and wife were living together during the time of conception but the DNA test revealed that the child was not fathered by the

⁹⁸ sec. 112 of the evidence act 1872.

⁹⁹ (1993)3SCC418, p.428, also held in *Vasu v. Santha*, 1975, Ker. H.C., 533.

¹⁰⁰ AIR 2001 SC 2226; (2001) 5 SCC 311.

¹⁰¹ *Ibid.*

husband, the conclusiveness in law would remain irrebuttable. This may look hard from the point of view of the husband who would be compelled to bear the fatherhood of a child of which he may be innocent. But even in such a case, the law leans in favour of the innocent child from being bastardized if his mother and her spouse were living together during the time of conception.¹⁰²

The conclusive proof makes law not only static or standstill, but also rigid like an organised religion. It pronounces that, "whatever you may believe or whatever may be the fact, this forum will not consider your say, in fact you do not have any right to have your say", it arrogantly throws out the litigant. It is totally against the basic concept or rather requirement of justice that justice must also appear to be done.¹⁰³

In case of *Bachubai Khasiya v. State of Gujarat & Another*¹⁰⁴, it was held by the court that the science of DNA is at a developing stage and when the Random occurrence Ratio is not available for Indian society, it would be a risky act solely on a positive DNA report, because only if the DNA profile of the accused matches with the foetus, it cannot be considered as conclusive proof of paternity. Contrarily, if it is a solitary piece of evidence with the possibility of involvement of the accused in the offence".

In *State of Karnataka v. M.V. Mahesh*, the applicant's wife had disappeared and an investigation was launched. Some human bones were recovered which were subjected to DNA of her close relatives, indicating that they may have belonged to her.

In *Patingi Balaram Venkata Ganesh v. State of Andhra Pradesh*¹⁰⁵, it was alleged that the accused and the co-accused had fired at the deceased. Witnesses identified the assailant as wearing a pink shirt and testified that the accused had been injured during the firing. The pistol and the blood stained pink shirt were recovered and blood found on the shirt to match with the blood of the accused as per DNA. The court relied on all the available evidence including the DNA evidence, found him guilty.

102 B. R. B V. J. B (1970) 2 All. ER 1023.

103 Dr. Rajeev Joshi, "Section 112 of Evidence Act, is conclusive proof intra vires", CrilJ 145.

104 2009(4) R.C.R. (criminal) 186.

105 (2003) CrilJ 4508.

The womanhood constitutes half of the population of the world but they are still an exploited lot. Inhuman treatment such as honour killing is being meted out to them rampantly suspecting their fidelity, which amounts to gross violation of human rights?¹⁰⁶ The courts in the absence of any specific legislation or executive guidelines are helpless to order the parties to undergo DNA test. Sec.125 of the Code of Criminal Procedure, 1973 lays down the natural and fundamental duty of a man to maintain his legally wedded wife, children and parents so long as they are unable to maintain themselves. It provides a speedy remedy against starvation for a deserted wife, children and parents. Most of the times, in such cases parentage of children is in dispute. Therefore to establish paternity, apart from adducing the oral and documentary evidence, the most warranted evidence is of medical proof in the form of DNA test.

In England, the Affiliation Proceeding Act was passed in 1957 whereby to establish paternity the mother's evidence had to be corroborated by other facts such as blood test. The Family Reforms Act, 1969 granted powers to the courts to admit blood test reports in the proceedings of paternity. However, the English courts neither had the power to compel a person to submit for such a test, nor were able to draw any adverse inferences against refusal to do such test.¹⁰⁷ Finally, the Family Reforms Act of 1987 enabled the English Courts to ask the parties to undergo blood tests. In United States of America, DNA tests have become a part of legislations like DNA Identification Act, 1994, Transplantation of Human Organs Act, 1994 and Advancement Of Justice through DNA Technology Act 2003 in our country though there is judicial acceptability of such tests, yet they can be exercised in case of *ex debito justitiae* and not on mere invocation of parties or on the mere volition of the courts. Unless the necessary laws are enacted at par with the laws of the developed nations the DNA technology would not be helpful in solving the disputed matters in India.

The Law Commission of India headed by Justice M. Jajannath Rao in its 185th report of the Union Ministry of law & justice in the year 2003, has suggested changes to the Section 112 of Indian Evidence Act 1872 for the inclusion of DNA test in the

¹⁰⁶ Famous Arushi Murder case of Noida is worth mentioning in this context.

¹⁰⁷ <http://www.legalservice.com> (visited on date 12-09-2102).

part of the section by broadening the criteria.¹⁰⁸ On the changes suggested by the Law Commission the Indian Evidence Bill, 2003 is still pending before the Indian Parliament. The Bill had suggested the recasting of the language of Section 112 to include DNA test. While studying the comment of the law commission it becomes quite palpable that the Commission does not intend to apply the DNA test to positively prove that alleged person is not the father. The commission recommended that a person refusing to undergo DNA test should not be allowed to take a defensive stand that he is not the father.¹⁰⁹

4.12 Post Conviction DNA Testing: - An Over View

The phenomenon of exoneration as of wrongfully convicted prisoner through post conviction DNA Testing has received extensive and very positive media coverage. However, post conviction DNA Testing more often than not, provided either inconclusive result or in many cases confirmed the guilt of the prisoner seeking testing.¹¹⁰

The fairy tale like story of the innocent men wrongly accused and convicted of a crime, later freed through post conviction DNA Testing, is told every week in magazines, newspaper comment, television shows and radio interviews.¹¹¹ DNA proof can be exercised to know the blamelessness of person. The ability of DNA proof to exclude a person conclusively has made DNA profiling a valuable tool in post conviction reviews. In case where the identity of the performer was at issue, and where the prosecution had relied on circumstantial evidence, DNA evidence can play a leading role in overturning a wrongful conviction. Post conviction request in which DNA evidence is available for testing and the testing results are likely to exonerate the convict, should be handled with great care when it becomes necessary to obtain samples from the victim and third party for the testing processes¹¹².

108 The language of the proposed sec.112 provides exception to DNA test to the prosecution of paternity by providing provision or the DNA printing test with the consent of man and in case of child by the permission of a court or finding out that a man is not father of a child.

109 Nikhil Gurnani, "Exclusion of DNA Test under Sec 112 of The Indian Evidence Act 1872: A senseless or a meaningful exclusion" 117 CrLJ 119(2011).

110 Gwendolyn Carroll, "Proven Guilty: An Examination of the Penalty-Free World of Post-Conviction DNA Testing" 665, The Journal of Criminal Law & Criminology, (2007, Vol.2).

111 *Ibid*.

112 See E.g. the aftermath of murder: daughter of victim, daughter of man convicted in Long ago murder clash over his fate, St. Louis Post- dispatch, Oct.23, 2005 at a to Stephanie booth, I fight for wrongfully convicted prisoner; hundred of innocent men have been locked up for violent crimes, they did not commit, cosmopolitans. 2005 at 232 ; Front line: what Jennifer saw(PBS

DNA technology is not only useful for strengthening cases against suspect but has become extremely helpful in proving innocence of suspect and even post convict. The National Institute of Justice under the guidance of Former Attorney General Janet Reno issued a report in 1996, entitled “Convicted by juries Exonerated by science” case studies where the uses of previously unavailable DNA technology proved the innocence of convicted felons. There Twenty-eight men in the study had served an average of seven years in prison before exoneration. Thereafter the initial report, the National Commission on the future use DNA evidence issued another report entitled “Post conviction DNA testing: Recommendation for Handling Requests”. This report was aimed at highlighting legal and scientific issues involved in post conviction testing and provided recommendation for prosecutors, defense counsel, the judiciary, victim assistance group, and laboratory and law enforcement personal. The post conviction cases highlight the importance of DNA technology and more specifically DNA database, as an investigative tool.

The DNA evidence is now a predominant forensic technique for identifying criminals when biological tissues are left at scene of crime. DNA testing on sample such as saliva, skin, blood, hair or semen not only helps to convicts but also serves to exonerate. The sophisticated technology makes it possible to obtain conclusive result in case in which the previous testing has been inconclusive. The probative value of DNA testing has been steadily increasing to conduct their test advances¹¹³.

In the Indian context, the Constitution empowers the President of India under Art. 72 and the Governor of a State Article 161 to grant pardon, reprieves, respites, remission of punishment to suspend, remit or commute the sentence of any person convicted of the offences referred to their under.

4.13 Admissibility of DNA Evidence

The advancement of science had a great impact on law. The Govt. of India has taken note of the recent advancements in science and past appropriate legislations. Judges have to follow those enactments and apply the same whenever the need arise. As such legislators and Judges cannot remain aloof from the latest scientific advancement. Even in the absence of appropriate legislation, the Judges have applied

Television broadcast Feb.25 1997), stories of the innocent project :Marvin Anderson’s Nightmare (Court T.V television broadcast 2004).

113 C.Allison Puri- “An International DNA data base: Balancing hope, Privacy and Scientific Errors.

the scientific technique in solving disputes provided they did not expressly contravene the existing law. The latest example is the use of DNA; though legislation has not been passed in this regard even then it is used in appropriate cases.¹¹⁴

In India, DNA evidence was first presented in 1991 in the Kerala High Court in a paternity dispute (case of a well to do bus operator accused of fathering a child by his typist).¹¹⁵

The evidence to be admissible at trial must be relevant. The purpose of evidence is aptly described by the witness. In other words, witness is the voice of evidence. The courts from all over the world have recognized the importance of DNA evidence. It is being used to solve and prove the old as well as new cases, either civil or criminal and also the cases pertaining to paternity/ maternity disputes. It is appreciated due to its extreme accuracy and reliability. In India the courts are also relying on DNA technology but it appears that it is done reluctantly. The reasons are many fold. Firstly, it is considered to be in a case rudimentary stage; secondly, it is not a statutory recognition, and thirdly, that the presiding Judges of court themselves do not have sufficient scientific knowledge to fully appreciate its technicalities. Since DNA technology is recognized throughout the world and it is widely accepted in the legal system in some of the countries of the world, the Indian courts should also have the same attitude. Even in the absence of any statutory recognition, it is submitted that DNA testing can be utilized in Indian cases.¹¹⁶

In the of any absence specific legislation, in India regarding acceptability of scientific evidence, the court has the discretion of admitting it under Section 45, Indian Evidence Act, 1872. Before admitting it in evidence, the court may consider following aspects viz-

- (a) Whether the technique is reliable or not?
- (b) Whether it is supported by publication or peer review?
- (c) What is the rate of error in such testing?
- (d) Whether it is generally accepted by the Scientific Community?

114 The Gene Age- A legal Prospective, organize by centre for DNA Fingerprinting and Diagnostics, Hyderabad and Nalsar university of law, Hyderabad, document prepared by Hon'ble Mr. Justice R.K. Abhichandani, Judge High Court of Gujarat, 20.

115 *Supra* 69.

116 *Ibid*, .20.

- (e) Whether it was necessary in this case to give the order for scientific examination?
- (f) What are the standards of the procedure of testing etc?

In case of *Geetha v. state of Kerala*¹¹⁷, the court held that the DNA testing report of CDFD, Hyderabad (A.P.), was inadmissible under Sec.293Cr.p.c.

In case of *Vishal Motising vasava v. State of Gujarat*¹¹⁸, DNA test of husband was already carried out and wife was unaware of it, report of such DNA test was found negative. Wife moved application for second DNA test of husband at her choice of Forensic Science Library. On this application the court said that the session Judge had discretionary power to allow the second test and order for the same. Exercising such power is legal but the complainant cannot insist that such test be carried out at particular laboratory. Complainant had no such vested right and the state may carry out DNA test at the nearest FSL.

In case of *Chandan Panalal Jaiswal v. State of Gujarat*,¹¹⁹ the court considered that DNA analysis is a powerful identification technique and it should be used carefully. Therefore, case in collection, custody and manipulation by biological sample (s) is of great importance for the validity of this analysis. In case of *Syed Mohd. Ghouse v. Noorunisa Begum*¹²⁰, the wife and the minor girl filed a petition for maintenance against the appellant. In this case the marriage was not denied by the petitioner but the paternity was denied. Consequently, the petitioner refused to maintain his girl child. He demands for blood test of girl child so that it may be prove that he was not the father of that child. The apex court order for conducting the blood test for the benefit of the girl child. The court held that while considering an application seeking for DNA test, the court has to consider about the facts and circumstances and ramifications of such an order. In another case i.e. *Banarsi Das v. Teeku Dutta*¹²¹, the court has held that DNA test orders is not allowed as a matter of routine.

117 (2005)2DMC286:2005(3) crimesto73 (ker.).

118 2004CriLJ (3088) Guj.

119 2004CriLJ 2992(2994). (Gujarat).

120 (2001)2DMC 454.

121 2005 (52) A Cric 481 (S.C).

In case of *Mahmood v. State U.P.*¹²², it was held that when an Inspector had not given any reason in support of his opinion, nor had it been shown that he has acquired special skill, knowledge and experience in the science of identification of fingerprint, it would be highly unsafe to convict one on a Capital charge without any independent corroboration, solely on the bold and dogmatic opinion of such a person, even in such opinion is assumed to be admissible under Sec. 45 of Indian Evidence Act.

In *Madhumita Shukla Murder Case*¹²³ Amarmani Tripathi, who was then a minister in the Mayawati-led Bahujan Samaj Party-Bharatiya Janata Party coalition government, was accused of murdering the 24-year-old poetess because she allegedly refused to abort her child. Tripathi was arrested by the Central Bureau of Investigation on September 21, 2003 after a DNA test confirmed that the foetus matched with his DNA.

4.14 DNA Evidence – First Admissibility in India

The first Case on DNA test was from Kerala. The first case related with DNA test is *Kunihiraman v. Manoj Singh*¹²⁴. This case was decided by Justice Tellicherry. In this case the parties were directed to undergo the DNA fingerprinting test, in order to establish the paternity of a child whose paternity was disputed. Both the parties were willing to undergo the test, which was conducted at the Centre of Cellular and Molecular Biology, Hyderabad. The fact of this case is as follows:-

Vilasini, a village girl from Kannur District in Kerala, had studied upto the tenth standard and was a deposit collector for a private financial institution. During the course of her business, she enrolled one Kunihiraman, a distant relative, as a depositor of the firm's scheme. He was a bus operator with a sound financial background. She had to visit his house frequently, in order to collect the instalment. This resulted in an intimacy with him and an illegitimate child was born. Though the promise of marriage was given by Kunhiraman to Vilasini, he finally disowned her. In her distress, Vilasini abandoned the child, for which she had to face a prosecution. On acquittal, she requested Kunhiraman to pay for the maintenance of the child which he refused to do. Thereupon, a petition was filed by her before the Chief Judicial

122 1976 CriLJ .10(13) (S.C.).

123 AIR 2005 SC.

124 (1991) 3 crimes 860 (ker.).

Magistrate, Tellicherry for maintenance. The claim was for a monthly allowance of Rs 500/- for the child.

Kunhiraman contended that he had no relationship whatsoever with the petitioner and stated that the child was not his progeny.

The lower court judgment 24-4-1990 was challenged in Kerala High Court but the judgment was upheld and court observed that DNA testing could by itself may be deciding factor for setting the paternity dispute. The court also held that it is admissible just like Ballistic and fingerprints expert opinion.¹²⁵

4.15 DNA and Criminal Justice Administrations

The 21st century started with a very inauspicious note regarding the attack on World Trade Centre in New York which left us in no doubt that the new age, the criminals are no longer illiterate rogues but highly educated, qualified and motivated men. Therefore, the crime investigation trends too are undergoing rapid changes globally, depending increasingly upon the more reliable scientific evidence namely DNA fingerprinting.

Nowadays DNA fingerprinting is being used to identify mutilated dead bodies as was done in the WTC attack or after the earthquake in Gujarat. It is also used to gather relevant information about and to identify the terrorists killed in an encounter as was done in Akshardham attack or after the attack on Indian Parliament. After checking the DNA evidence found at the site of WTC, investigators could identify the leader of the terrorists and established his links with Al-Qaida. Unlike the Civil Proceedings or paternity disputes, the Criminal Courts in India have accepted DNA test. In *Rajiv Gandhi Bomb Blast*¹²⁶ case, the DNA sample of the alleged assassin Dhanu were compared with her relatives, which gave concrete proof of her involvement in the crime and likewise in famous case *Sushil Sharma V. The Delhi Administration*¹²⁷ (also known as *Tandoor Murder Case*) DNA sample of Naina Sahni were compared with the sample of her parents to conclusively establish her identity. Though no specific DNA legislation was enacted in India till date Sec53 & Sec.54 of the Code of Criminal Procedure, 1973 provided for DNA test impliedly and

125 P.M. Bakshi, *Law and Medicine* 281(Institute of Judicial Training & Research, U.P., First Edn. 1993).

126 AIR 1999 SC 2640.

127 1996CrilJ 3944.

they were extensively used in determining the complex criminal problems. Sec. 53 deals with examination of the accused by medical practitioner at the request of police officer if there are reasonable grounds to believe that an examination of his person will afford evidence as to the commission of the offence.¹²⁸

In *Neeraj Sharma v. State of Punjab*,¹²⁹ the High Court observed that police power of taking samples of blood etc. could be exercised by the Magistrate and is not violative of article 20(3) of the Constitution.

Sec. 54 of the Cr.p.c.1973 further provides for the examination of the arrested person.¹³⁰ The law commission of India in its 37th Report stated that to facilitate effective investigation, provision has been made authorizing an examination of arrested person by a medical practitioner, if from the nature of the alleged offence or the circumstances under which it is alleged to have been committed, there are reasonable grounds for believing that an examination of the person will afford evidence.¹³¹ Our country has been fighting vigorously against Terrorism for the last two decades. Thus our legislature had a compulsion to enact Prevention of Terrorism Act (POTA), 2002. According to Sec. 27(1) of POTA, When an investigating officer requests the court of CJM or the court of CMM in writing for obtaining sample of hand writing, finger prints, footprints, photographs, blood, saliva, semen, hair, voice of any accused person, a reasonable suspect to be involved in the commission of an offence under this Act, it shall be lawful for the court of CJM or the court of CMM to direct that such samples shall be given by the accused person to the police officer either through a medical practitioner or otherwise as the case may be. The phenomenon of terrorism is not unique to India. USA too has, after the attack of 9/11 has enacted the Patriot Act 2001, Sec. N503 of which provides for DNA identification of terrorists and other violent offenders. There are two other federal Acts too in the United States that provide for DNA tests namely The Innocence protection Act, 2003 and the advancement of justice through DNA Technology Act 2003. The first Act is in favour of a person wrongly convicted as he can ask for a DNA test to be done in order to prove his innocence and the second Act pertains to solve the pending cases with the help of DNA technology. In view of the recent

¹²⁸ *Ibid.*

¹²⁹ 1953 CriLJ 2226 (Allah.).

¹³⁰ *Supra.* 32.

¹³¹ [http: / www. Manupatra.Com](http://www.Manupatra.Com) (visited on date 19- 5- 2008).

development in the field of forensic science the Indian Government constituted a committee under the chairmanship of Justice V.S. Malimath in order to suggest effective reforms in the existing criminal justice system. The committee unanimously suggested comprehensive use of forensic science in crime investigation. An induction of DNA expert in the list of experts as provided under Section 293(4) Of Cr.P.C, 1973.¹³²

The committee further recommended the amendment of Section 482 of Criminal Procedure Code dealing with the power of the high court. A recommendation regarding the amendments of Section 4 of The Identification of Prisoners Act, 1920, was also suggested by the committee which was on the lines Section 27 of POTA, 2002. Moreover Section 313 of the Code of Criminal Procedure, 1973 was also recommended to be amended in order to draw adverse inference against the accused where he fails to answer regarding any important material against him. This would surely facilitate the law enforcement agencies and the police to employ DNA Profiling against the accused. .

It must also be borne in the mind that the above mentioned submissions in the form of suggestions may not be misused by the enforcers of the law.¹³³

In criminal Procedure Code by Code of Criminal Procedure (Amendment) Act, 2005 two new sections, Sec 53-A (2) (iv) and 164-A has been added , Sec 53 – A(2)(IV) provide that the registered medical practioner conducting such examination shall, without delay, examine such person and prepare a report of his examination giving the following particulars, namely : 53-A(2)(iv) the description of material taken from the person of the accused of DNA profiling, and Sec 164A (2) (iii) provides that the registered medical practitioner to whom such woman is sent shall, without delay, examine person and prepare a report of his examination giving the following particulars, namely:- 164A (2) (III) the description of materials taken from the person of the woman for DNA profiling .¹³⁴

In *Bhatia Devi alias Babli & another V. State of Jharkhand & another*¹³⁵, a petition was filed for DNA test by petitioner no.1. Petitioner no.2 said that petitioner no.1 was legally married wife of opposite party. During maintenance proceedings,

¹³² Item 38, Malimath Committee report on reforms of criminal justice system 2003.

¹³³ Ibid.

¹³⁴ Code of Criminal Procedure (Amendment) Act, 2005, (w.e.f. of 23-6 -2006).

¹³⁵ 2011, CriLJ. , 3643.

request for DNA test was made –the stand of opposite party that at no point of time he established sexual relation with petitioner no.1 after their marriage since he had no access to her -& petitioner no.2 was born to petitioner no.1 from earlier wedlock-no clear & satisfactory proof of no access-order passed by Family Court rejecting request for DNA test to establish the paternity.

In *Bhabani Prasad Jena v. Convener Secretary, Orissa State Commission for Woman and another*¹³⁶, it was held DNA test is a matter relating to the paternity of a child, should not be directed by the court as a matter of course in a routine manner, whenever such a request is made. The court has to consider diverse aspects including presumption under Sec.112 of the Evidence Act pros and cons of such order and the test of eminent need, whether it is not possible for the court to reach the truth without the use of this test.

In *Halappa v. State of Karnataka*,¹³⁷ it was held by the court that the blood sample of the accused of an offence of the rape can be taken without his consent for the purpose of DNA test. It is not the violation of Art. 20(3) because the offence of rape is very serious offence and it is an offence against the society at large.

***Rohit Shekar v. Shri Narayan Dutt Tiwari*¹³⁸** in this case the Delhi High Court (in a paternity dispute case) examined the concept of DNA testing and the law pertaining to the same. S. Ravindra Bhatt J. culled out the prevalent laws on the subject and examined them in the light of international decision, international human right instrument and national legislation and finally directed the defendant to undergo DNA test to ascertain the paternity of the claimant. In this case, the court having relied on international human right instrument and expressed the views that the right of the child to know (her or his) biological antecedent is now recognised internationally as being of crucial importance. Major international instrument such as the UN Declaration on Human Rights have recognised the rights of a child irrespective of her or his legitimacy and article 7 of the Convention on the Rights of the Child (CRC), 1989 has expressly specified a right to knowledge of parenthood. In this case on the behalf of the DNA test it was proved that N D Tiwari the biological father of Rohit Agrawal.

¹³⁶ (2010), 8, SCC .633.

¹³⁷ 2010, Cri.L.J.4341.

¹³⁸ 2011 (121) dRJ562 (Delhi) .The SC refused to give in relief to the respondent.

In *Anand Pasi v. State of U.P. & Another*¹³⁹, it was observed by the court that under Section 293 of the Criminal procedure code, a report of scientific expert duly submitted by him for examination or analysis can be used as evidence without examine the expert under certain circumstances.

4.16 Conclusion

In India great importance has been attached to the technique of DNA Profiling. Infact various courts have also given their due recognitions to this modern technology. Thus with the help of DNA Profiling different complicated cases particularly relating to crimes and paternity have been easily solved. Keeping in view that today in the present society, the shrewd perpetrators of crimes are continuously engaged in the commission of highly sophisticated newer crimes with great impunity, using complicated modus operandi, there is an urgent need for a more rigorous, specific recent law on DNA Profiling to be enacted by the Government of India. Nonetheless in this regard a detailed comprehensive Bill entitled "*Human DNA Profiling Bill 2012*" has already been drafted in India. (*See Annexure I*)

139 2014 Cri.L.J.1992.

Chapter V

Narco-Analysis: A Boon for Criminal Justice System

NARCO-ANALYSIS: A BOON FOR CRIMINAL JUSTICE SYSTEM IN INDIA

5.1 Introduction

Law is dynamic and not static and therefore, as society evolves, law has to keep in consonance with the changing social order. Law is the instrument of societal change and the judiciary has the responsibility of interpreting the law for the greater good.¹ Therefore, it is clear that the judicial mind must stay in touch and keep in step with the advancement of humanity. To combat organised crime, its detection, investigation and prevention method have to be employed synchronously.² If the criminals use new technology in committing the crimes, the enforcement agencies have to be used to the new techniques in solving such crimes. If the enforcement agencies do not use these new technologies for solving such complicated the crimes, it would be very difficult to detect the perpetrators of such crimes. Therefore, in the context of the changing organised modern criminal who are taking shelters behind and making full use of new sophisticated technologies .Krishna Iyyer J. Remarked, “the courts self-criminate themselves if they keep the gates partly open for culprit to flee the justice under the guise of interpretative enlargement of golden rule of criminal jurisprudence³.

Across the globe, methods of law enforcement are witnessing colossal changes with progress in science and technology. The contemporary society needs recent scientific methods of crime recognition, in case the general public go unprotected. There are several methods for crime investigation to detect lying and deception by suspect and accused. Most of the techniques are founded on torture, either physical or mental. But modern techniques like Polygraph and brain-mapping test are non invasive method that will detect deception without causing physical or mental injury to the subject.⁴ Methods of investigation are witnessing rapid shifts with the amalgamation of scientific techniques and criminal procedure. Scientific techniques are necessary for proving the guilt as well as innocence of the accused.⁵ As science

1 Philosophy propounded by Jeremy Bentham and John StuArticle Mills.

2 Nathuni Yadav v. State of Bihar (1998)9 SCC 238 at 242.

3 Nandini Sathpathy v. P.L. Dani & Anr. AIR 1978 SC 1025 at 1032.

4 Dr. B. Umadethan, "Medico-legal Aspects of Narco-Analysis"2 Nual Law Journal 21 (2008).

5 Anjaneya Das and Arun Kumar "Narco-analysis and the shifting paradigms of art. 20(3): A comment of Selvi v. State of Karnataka" 37 Indian Journal of Criminology 120 (2009).

has outpaced the development of law or at least the laymen's understanding of it, there is inevitable difficulty concerning what can be acknowledged as proof in court. Narco-Analysis is one such scientific progress that has become an increasingly perhaps alarmingly, common in India.⁶

Narcosis is a state of stupor induced by drugs. The use of narcotics as a therapeutic aid in psychiatry was limited to the use of opium for mental disorder by the early Egyptians. J. Stephen Horsely introduced the term "Narco-Analysis" in 1936 for the use of narcotics to induce a trances like state in which the patient talks freely and intensive psychotherapy may be applied. Now days psychoanalytical and narcoanalytical tests are carried out to interpret the behaviour of the suspect, accused person or the criminals.⁷

The term Narco-Analysis though a misnomer is becoming very popular in law enforcement and judicial circle. Abreaction is a method of psycho-analysis practiced by psychiatrist, where in a short acting narcotic drug is administered to the patient to induce a hypnotic stage.⁸ Narco-Analysis is thus a mode of psychotherapy which is an aid to the scientific interrogation in reality. It is a process whereby a person is put to sleep or into semi-conscious state by means of chemical injection and then interrogated while in this dream like state. It is the view of the scientist who conducts the Narco-Analysis test on the person who is suspect, that in semi-conscious state person losses self control and speak truth.⁹

5.2 Meaning and Concept of Narco-Analysis Test

Generally it is viewed that if a drug is given to person which repress his power to reasoning without affecting the memory and speak, it is possible to made him to speak truth. The underlying theory is that a person is able to lie by using his imagination, but due to the influence of drug a person losses his self control as a result of which he fails to imagine the fact and would speak the truth. In this state it is very difficult for him to tell lies, rather he would talk about which he had the knowledge. The utilization of such drug in police work or interrogation is alike to the traditional

⁶ www.truthorlie.com/nopwpoly.html. (Visited on date 22-02-2011).

⁷ Deepak Ratan and Mohd. Hasan, Zaidi, *Forensic Science in India and the World* 357 (Allahabad Law Agency, Allahabad, edn. 2008).

⁸ *Supra* 4, 22.

⁹ *Ibid.*

psychiatric practice of Narco- Analysis and the only difference in the two procedures is the difference in the objectives.¹⁰

A new terminology had been added in the field of Criminal investigation through forensic science in the year 1936 which is known as Narco-Analysis test.¹¹ The term 'Narco-Analysis' is derived from the Greek word Narco (meaning "anaesthesia" or "torpor") and is used to describe diagnostic and psychotherapeutic techniques that used psychotropic drugs ,particularly barbiturates to induce a stupor in which mental element with strong associated effect come to the surface, where they can be exploited by the therapist .¹² It is also known as drug hypnosis or a truth serum or a combination of hypnosis or narcosis .Thus it is method to make human thought and communication manageable.¹³ According to Webster Dictionary, "Narco-Analysis means psycho analysis in a state which is similar to sleep and this state is achieved by use of drugs. These drugs are known as 'truth drugs' or 'truth serum'."

According to the online Merriam Webster's Medical Dictionary, Psychotherapy that is performed under sedation for the recovery of repressed memories together with the emotion accompanying the experience is designed to facilitate an acceptable integration of the experience in the patient's personality.

It can also be defined as a psychotherapy that is conducted while the patient is in sleep like state induced by barbiturates or other drugs, particularly as a means of releasing repressed thoughts, feelings or memories. It's use is limited to such situation when there is compelling, instant requirement for a patient's responses.¹⁴

Narco-Analysis test is also known as "truth Serum test". They are the drugs sometimes used clinically. Some of them are seconal, Hyoscine (scopolamine), Sodium Penthonol, Sodium Amythal and Phenobarbital. These drugs produce a state of semi-consciousness in the subject and the reasoning faculty of the individual becomes ineffective. These drugs works on the principle of inhibiting the thought filtration procedure of the brain. The principle behind this is that when we lie, our

10 Critical Study on validity of Narco-Analysis with reference to Articleicle 20(3) of the Indian Constitution available at www.goole.com(visited on date 12-11-2013).

11 Gujarat Law Herald sponsored by the Bar Council of Gujarat, 2009(2), 44.

12 Robert house, a Texas obstetrician used the drug scopolamine on two prisoner in 1922.

13 Naresh Kumar and Ved Pal Singh, "Narco-Analysis test in investigation process: Law and judiciary" XIV, MDU Law Journl108 (2009).

14 M.Sivananda Reddy, "Narco-Analysis and Truth Serum" ,Criminal Investigation Departiclements of Andhra Pradesh ,available at www.cidap.gov.in /document/Narco-Analysis(visited on may 23,2013)

thoughts are filter by the brain and decides by the brain what is to be exposed and what has to be unrevealed. By application of this procedure a person can no longer sift his idea and to speak the truth, or so is supposed.¹⁵

Thus this test is a scientific procedure to obtain information from an individual in a natural sleep-like state and a person is liable to lie by using his imagination. In the Narco-Analysis test, the subject's inhibition are down by prying with his nervous system at the molecular level. In this state, it becomes difficult although possible for him to lie. In such a sleep like state efforts are made to get "probative truth" about the offence.¹⁶

Narco-Analysis test is conducted by 3 gram of Sodium Pentothal¹⁷ dissolved in 3000 ml of distilled water and the solution is administered intravenously along with 10% of dextrose over periods of three hours with the help of a qualified anaesthetist.¹⁸ It is a barbiturate (thiopental sodium) making the neural membrane more permeable to Chloride ions, resulting in the general inhibition, starting with the cortex and working down to the lower brain regions with increasing biological effects at just neural inhibitory effect to create an alcohol-like disinhibition". At of normal behaviours restraints. A higher dosage may create a stupor and inhibit independent thought and actions to a greater extent.¹⁹ Essentially, the drug is used to reduce resistance to the hypnotist, who then has to frame question and evoke response in a way likely to produce accurate answer. However this possess many problems. Too little narcotics and the subject may be able to fake through the situation, too much and they may become unconscious, the accuracy of answer may be effected. Sodium Pentothal binds GABA(gamma amino butyric acid) (Chloride channel super complex, which is the primary inhibitory neurotransmitter channel in brain) forming a complex at a site, which exerts control over the permeability of chloride ions in to neural membrane leading to the attainment of "the state of disinhibition". At a dose, which does not cause sleep, or rather unconscious, disinhibition". At does remove the barrier of inhibition and it is difficult for anyone to lie at this stage.

15 Rajesh Punia "Narco-Analysis Investigating Tool or A Torture?" 115CrilJ 22(2009).

16 Lakshman Sriram, "Narco-Analysis and Hard fact"24, Frontline 97, (2007).

17 Yellowish White powder Alliacious, garlic like odor soluble in water alcohol.

18 Preparation is covered by US Patents 2153729(1939)2876225(1959).

19 Vikas Gupta, "Constitutional validity of Narco-Analysis test in Forensic Science" 49Journal of The Indian Law Institute 531 (2008).

Dr. Mohan, the Director, state Forensic Science Laboratory, Bangalore, opines that a person would not lie at all when administered with this drug. According to him the Narco-Analysis procedure depends upon the effect of bio-molecules on the bio-activity of an individual. This is evident as the drug depresses the central nervous system, lowers blood pressure and slow the heart rate , putting the subject in to a hypnotic trance resulting in a lack of inhibition .This subject is then interrogated by a team compressing of an anaesthesiologist, a psychiatrist, a clinical/forensic psychologist,²⁰ an audio-video graphed and supporting nursing staff. The member of team monitor reaction facial expression, pulse rate, heart beat and body temperature of the accused. The entire conduct of the procedure is video graphed. The questions are designated carefully and are repeated persistently in order to reduce the ambiguities during drugs interrogation. The forensic Psychologist will prepare the report about the revelations. After the Narco-Analysis examination is over the suspect is made to relax for 2-3 hours. The report prepared by the expert is useful in the process of collecting the evidence. Based on the test report investigator corroborates information gathered previously on a person's involvement in crime. The strength of the revelation, if necessary, is further verified by subjecting the person to polygraph and brain-Mapping test.²¹

The subject is interrogated by the investigating agencies in the presence of the team of doctors. All the process during the test is recorded both in video and audio cassettes. The report prepared by the expert is used in the process of collecting evidence. This test is conducted by the expert in the government hospitals after a court order is passed instructing the doctors or hospital authorities to conduct the test. Personal consent of the accused person is also required.²² In this test dosages of drug may vary according to sex, age, health and physical condition of the subject .The drug depresses central nervous system (CNS) and makes the heart beat slower and blood pressure also lower down. When the person's speech becomes slurred and he/she behaves in a cooperative manner and also becomes more talkative it may be presumed that he/she is under full control of drug .Slurred speech is generally a symptom of semi-narcotic state of patient. The examiner satisfies himself/herself by testing the

20 Charanjiv Singh, "Narco-Analysis –A new trend in forensic Science .As a tool of investigation"PULJ 237 (2007).

21 *Ibid.*

22 Narco test and its value available at www.truthorlie.com(visited on date 21-11-2013).

patient's eye muscles with his/her finger. Needle is left in the vein of the patient as different persons need different doses of the drug and also for continued narcotic state, further administration of drug is necessary. Care is taken when drug is administered which may keep the patient in semi-awake state and he/she does not go in deep sleep state, the drug is safe.²³

In such hypnotic stage the investigation agencies ask the question from the suspect and the suspect give answer of the question without fabricating the false statement due to effect of medicine. Because it is believed that Sodium Pentothal, Sodium Amythal or Scopolamine makes the subject's power to keep from divulging the required information. But it is not the complete truth. These drugs do relax the subject, but the researcher found that in a number of cases the subject retained their ability not to divulge the fact that these drugs have caused some persons who have totally forgotten the event and with the help of these drugs the subject was able to recollect the fact.²⁴ The drugs used do not guarantee that the subject will speak only the truth.

5.3 Success Rate of Narco-Analysis Test

As long as the principles underlying the technologies are recognized as scientific, no parallel can be drawn with "torture". In The Forensic Science laboratory, Bangalore, More than 300 people has subjected to this test for committing various crimes. The success rate of this test was about to 96-97 percent as evaluated by the investigating agencies. About 25 percent of the total numbers of individuals subjected to Narco-Analysis test were proved to be innocent. Therefore, the rights no of innocent individuals stand established when the public and human rights activists protest that investigating agencies adopt third degree method to extract information from the accused; it is time the agencies took recourse to the scientific methods of investigation, because this technique is really very helpful in crime investigation.²⁵

5.4 History of Narco-Analysis Test

A person when in narcotized of mind reveals the truth and those thought which he/she normally conceals. Thomas De Quincy had done 1804 experiment he

²³ *Supra* 3,363.

²⁴ *Ibid.*

²⁵ *Supra* 13, 109.

wrote with these experiences that “opium like wine makes the heart expended and the person speak out his/her concealed feelings”. Narcosis can be achieved by using drug like cocaine, ether, alcohol, scopolamine, barbiturates, hallucinogens, etc. 1980 Sheer Chance used sodium cyanide for narcosis.²⁶

In between 1903-1915, investigators used mild types of anesthesia commonly used in obstetrical practices. For extracting the truth or obtaining confession from suspect investigation used alcohol as a truth serum which depressed the central nervous system (CNS) because they believed on time-honoured aphorism in vino veritas which means “where there is wine there is truth”. The alcohol produces a remarkable condor or freedom from inhibition and under the influence of this a person looses his/her tongue and eliminates repressive influence.²⁷

About a century ago with the advent of anesthesia it was observed that after administering drug the patients were prone to make extremely naïve remarks about personal matters which in their normal state would never have been revealed.²⁸

In the late 19th century ether, chloroform or hashish were used to induce person and to deepen the hypnotic effect. In early 20th century, barbiturates were administered for the psychotherapeutic treatments, these experiments showed that most of the patients showed uninhibited flow thoughts were revealed under its influence. In Narco-Analysis barbiturates induced state of excitation is created and patients recall forgotten and repressed conflicts, events and experience. These details also help in treatment of traumatic combat neurosis. In 1931, Italian psychoanalyst for the first time used mixture of mescaline (a hallucination drug that is extracted from the button shaped nodules on the stem of the peyote cactus- Bloomsbury's Concise English Dictionary, 2nd Edition, p. 906) and dhatura seeds for the purpose of psychoanalysis. It should be remembered that LSD (Lysergic Acid Diethylamide) was discovered in 1943 and it was then effectively used hallucination experience and later on this was used for psychotherapy. In 1953, it was observed that a single LSD application on neurotic patients was effective in abreactive memory activation. It was also found that by small dosages of hallucination useful images could be intensified and deepened. In 1960, the term “psycholysis” was in First European Symposium for

26 Satyendra Kaul Zaidi and Mohd., Hasan Zaidi, *Narcoanalysis, Brain Mapping, Hypnosis and Lie Detector Tests, In Introduction of Suspect 432*(Alia Law Agency, Allahabad, 2008).

27 *Id.* 432.

28 *Ibid.*

Psychotherapy under LSD- 25. Psycholysis includes psychoanalysis with low dosages of hallucinogens. These experiences were dreamlike but at the sometime it was a clear altered state of consciousness which could be processed.²⁹

The procedure adopted is that the patient is kept lying on a bed almost darn and is attended by a trained nurse who talks with the patient and dosages of drugs are injected. The patient is reminded that he/she is under physician's control and should surrender to the vision and images which appear before him/her without any reservation. His/her remarks during these processes is either tape-recorded or written and then handed over to a patient so that he/she may prepare a retrospective record. After that a drug free session of interview takes place. In this procedure drugs affected experience has a supporting role. These sessions continue for the several months and even up to a year. Psycholysis³⁰ is considered for patients who were reluctant to use any kind of therapy. In 1960's, psycholysis was used in 18 European centers and more than 7000 patients were treated within a periods of 15 years. In 1965, Alnaes and Grof suggested "a combination of psycholytic and psychedelic methods" and gave its name as 'psychedelytic'. It is most modern concept.³¹

5.5 Chronological list of discoveries and development in the field of Narco-Analysis

- In 1903, the drugs like barbiturates were first synthesized.
- In the 1st half of 20th century, 2005 drugs of barbiturates class have been prepared but about 24 of the drugs have been prescribed as medicine.
- In 1918, these drugs had given an unbelievable result on catatonic patient who had given mute rigid. After the injection of sodium cyanide by Arthur S. Lovenhart of University of Wisconsin the patient suddenly relaxed, open his eyes answered a few questions.
- In 1922, a Dallas Texas Obstetrician Robert House scopolamine as a truth drug on two imprisoned soldiers whose guilt seemed clearly confirmed but after the administration of the drugs both of them denied the charges framed against them under the influence of drugs and upon trial the court found that they were not guilty and they were exonerated.

²⁹ *Ibid.*

³⁰ *Ibid.*

³¹ *Id.*434

- From 1922 to 1930, these drugs were effectively used by the police in the interrogation of suspect to extract the truth or to obtain confession.
- In 1929, scientist Bleckwenn used the sodium Amythal first time directly through the mouth of a patient.
- In early 1930s, many psychiatrists were experimenting with drugs as an adjust to establish methods of therapy.
- In 1932, Lindermann gave for the first time small dosages of sodium Amythal intravenously to the patient.
- In 1935, some of the barbiturates were used on reluctant suspects by Clarence W. Muehberger, Head of the crime Detection Lab, East Lansing.
- In 1936, J.S. Horsely introduced the term Narco-Analysis.
- In 1942, Grinker and Spiegel coined the term "Narco-Analysis technique"³²

5.6 History of Novel Scientific and Technical Tools of Instigation with Reference of the Frye Case and Dubert Case

The history of the admissibility of scientific testimony involves two very instructive and interesting cases that illustrate the difficulties that courts have had in determining the standard for admissibility of novel scientific evidence.

The Frye case

Prior to 1923 in the United States, most courts treated scientific evidence the same as any other type. The rules governing the admissibility of evidence were derived from the Common Law. There was no codification of specific rules. In 1923, the landscape changed for novel scientific evidence, owing to a murder case in Washington, D.C. James Frye was on trial for murder. As part of his case, he sought to have introduced the result of a test that utilized a machine that could be considered the forerunner of today's polygraph. He claimed that the result of the test helped to prove that he was innocent. The prosecution objected to the admission of his novel evidence, and the judge agreed. On appeal, the court upheld the trial judge's decision. In effect the appeal court stated that, with respect to novel scientific evidence, not

³² Dr. B.R. Sharma, *Application of Forensic Science in India and World* 362 (Alia Law Agency, Allahabad, 2008).

only must it meet the relevancy slandered, but an additional hurdle must be overcome as revealed in its ruling.³³

Just when a scientific principle or discovery cross the line between the experimental and demonstrable stages is difficult to define. Some-where in this twilight zone the evidence force of the principle must be recognize, and while court will go a long way in admitting expert testimony deduced from a well recognised scientific principle or discovery , the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field to which it belongs.³⁴

Thus, the slandered for novel scientific or technical evidence that came out of this decision was that before new scientific technique could be introduced in court, the underlying principle that governed it, must have achieved general acceptance within the particular field to which it belongs. One important issue was not decided by the court, i.e. what constitutes general acceptance. In fact, this issue has never been clearly decided. It has come to mean, more or less by default, that the technique and principles should have been published in a peer reviewed journal or other equivalent exposure to the field. This implies that peer reviewed for a journal and publication means that a technique will be generally accepted. There are numerous examples in all scientific principle endeavors where this has not been borne out. Many valid and reliable scientific principles have never been published, and there are numerous examples of techniques that have been published and later shown to be unreliable.³⁵

Over the next 70 years, the federal courts and about half of the States used the Frye case as the yardstick to evaluate the admissibility of new scientific techniques. During that time a number of novel scientific techniques were subject to “Frye challenges” in various courts. They included Voiceprint Spectrography’ Blood Spatter Pattern Analysis, Polygraph analysis, and even DNA Typing techniques.³⁶

On, January 2, 1975, the Congress, the first time, approved an evidence code. This had been proposed by the U.S. Supreme Court in a preliminary draft from in 1969. Its effective date was July 1, 1975. The initial set of rules of evidence contained

33 Max H., Houck and Jay A. Siegel, *Fundamental of Forensic Science* 631(Academic Press, New York, 2006).

34 *Frye v. United States*, 293F, 1013, 1014(D.C.Cir. 1923).

35 *Ibid.*

36 *Ibid.*

a specific rule 702, the proponent of expert testimony had the burden of demonstrating that the expert was qualified and that the opinion evidence would have been helpful to the fact finder (the judge). After the new evidence code was adopted by Congress, federal and many state courts became divided as to whether Frye or the new Federal Rules should be used to determine the admissibility of the scientific evidence. The question was addressed and settled by the U.S. Supreme Court in *Dubert v. Merrill-Dow*³⁷, which is discussed as below:

Dubert v. Merrill-Dow

The plaintiff in *Dubert v. Merrill-Dow*, heard in federal District court, was a pregnant woman, who took Bendectin, a Merrill-Dow product that had been prescribed for many years to relieve Nausea that occurred during pregnancy. After her baby was born with birth defects, she sued Merrill-Dow, claiming that Bendectin caused the birth defect. Since biochemical causes of birth defects are not fully understood, there was no direct way for Deubert to establish directly that Bendectin was the cause of the defects. Instead, the plaintiff had to resort to epidemiology, the study of the cause and effects of disease on large populations. The plaintiff and defendant both retained statisticians to determine whether the instance of birth defects among women who took Bendectin during pregnancy were statistically greater than birth defects in the general population. The plaintiff's expert conclude that there was a significant increase in birth defects among Bendectin user's babies, whereas the defendant's expert conclude that the plaintiff's expert did not use methods that were generally accepted by the scientific community in reaching their conclusions; that is, they argued and ,upon a motion for summary judgment , found for the plaintiff, Merrill-Dow. Dubert appealed and eventually the case reached the U.S. Supreme court. The court ruled that the trial judge had used the wrong standard of admissibility in reaching his ruling. The Supreme Court concluded that the federal courts could not use the Frye rule any more in deciding question about the admissibility of scientific or technical evidence, and that the doctrine general acceptance was not the proper yardstick. Instead, the courts must use the Federal Rules of Evidenced relevance

³⁷ *Id.*, 639.

standard when evaluating the admissibility of novel scientific or technical evidence. The Court drew particular attention to FRE 702, reproduced here:³⁸

If scientific, technical, or other specialized knowledge will assist the trier-of-fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training or education, may testify thereto in the form of an opinion or otherwise.

In interpreting the federal Rules including 401, 402, 403, and 702, the court indicated that the judge must be the gatekeeper who decides when novel scientific evidence is admissible. In doing so, the court went as far as to suggest several criteria that a judge could use in the gatekeeper role. These criteria were not meant to be exhaustive, but not only suggestive:

- (a) **Falsifiability:** If, the underlying theory or principle behind a novel technique has been repeatedly tested to see, if, it is false and in all cases the theory is verified, this can be a good measure of validity. This is not amenable to all principles, and proper research design must be implemented for this to be a valid criterion.³⁹
- (b) **Knowledge of error rates:** If, the error rates of the result of a technique are known or can be estimated, then a judge could presumably make some determination as to the reliability and validity of a technique. For some techniques however, there is little or no qualifiable data available to determine an error rate.⁴⁰
- (c) **Peer review:** Certainly, a technique or method or principle that has survived the peer review process and has been found worthy of publication has demonstrated some level of scientific validity. This is tempered, however, by the issue of the quality and scholarliness of the journal in the applicable field.⁴¹
- (d) **General acceptance:** the Supreme Court of U.S. never meant discard general acceptance as an acceptable criterion for determining scientific validity. the court conclude that this should not be the only criterion and that there exist

38 *Id.*,640.

39 Naresh Kumar and Ved pal Singh, "Narco-Analysis test in investigation process: Law and judiciary"XIV,part-I,MDULJ 115(2009).

40 *Ibid.*

41 *Ibid.*

other, perhaps better ones. The court did not, however, seek to define what it meant by general acceptance.⁴²

In addition, the court's decision mandate that novel scientific techniques must be based on scientific principle, not speculation, and that the scientific basis for the principles had to be demonstrated.

5.7 Use of barbiturates in Narco-Analysis Test and its Effect on Human Body:

Now the police are using Narco-Analysis test as a handy method for investigation and substituting the physical coercion and time consuming inquiry through direct questioning (not to mention lack of skill and inefficiency being the reason in some cases) in to direct methods. When a person consumes or is being injected with an intoxicating substance, such as Barbiturates etc., the blood takes that material to the brain. Every substance which is present in blood is not capable of crossing blood-brain barrier, but almost all intoxicants are capable of crossing the barrier. For these reason these material are used as Anaesthesia agents to produce unconsciousness in surgical operations to diminish pain⁴³.

While using this drug in Narco-Analysis Test, it has got depressant effect on CNS and also over cardiac and respiratory system. It interferes and depresses cytochrome enzyme system. It reduces renal output, temperature regulating center fails and also cause rapid paralysis of the respiratory system.⁴⁴ In this test as with most drugs, little is known about the way barbiturates work or exactly how their action is related to their chemistry. But a great deal is known about the action itself. They can produce the entire range of depressant effects from mild sedation to deep anaesthesia and death.⁴⁵ In small doses, they are sedatives acting to reduce anxiety and responsiveness to the stressful situations; in these low doses, the drugs have been used in the treatment of many diseases, including peptic ulcer, high blood pressure, and various psychogenic disorders. At three to five times the sedative dose the same barbiturates are hypnotics and induce sleep or unconsciousness from which the

⁴² *Ibid.*

⁴³ Yawer Qazalbash, *Law of Lie Detectors* 49 (Universal Law Publishing Co., 2011).

⁴⁴ R.N Karmakar, *Forensic Medicine and Toxicology* 386, (Academic Publishers).

⁴⁵ Any derivative of barbituric acid (an organic acid from which various sedatives and sleep-inducing drugs are derived) used in the preparation of sedative and sleep-inducing drugs.

subject can be aroused. In larger doses a barbiturate acts as an anaesthetic, depressing the central nervous system as completely as a gaseous anaesthetic doses. In even larger doses, barbiturates cause death by stopping respiration. The barbiturates affect higher brain centres generally. The cerebral cortex that region of the cerebrum commonly thought to be of the most recent evolutionary development and the centre of the most complex mental activities seems to yield first to the disturbance of nerve-tissue function brought about by the drugs. Actually, there is reason to believe that the drugs depress cell functions without discrimination and that their selective action on the higher brain centres is due to the intricate functional relationship of cells in the central nervous system. Where there are chains of inter dependent cells, the drugs appear to have their most pronounced effects on the most complex chains, those controlling the most "human" functions. The lowest doses of barbiturates impair the functioning of the cerebral cortex by disabling the ascending (sensory) circuits of the nervous system. This occurs early in the sedation stage and has a calming effect not unlike a drink or two after dinner. The subject is less responsive to stimuli. At higher dosages, the cortex no longer actively integrates information, and the cerebellum, the "lesser brain" sometimes called the great modulator of nervous function, ceases to perform as a control box. It no longer compares cerebral output with input, no longer informs the cerebrum command centres of necessary corrections, and fails to generate correcting command signals itself. At this stage consciousness is lost and coma follows. The subject no longer responds even to noxious stimuli, and cannot be roused. Finally, in the last stage, respiration ceases.⁴⁶ In addition, it can be said that following danger may be caused out of Narco-Analysis test:

- 1) As, said overdose of Barbiturates, and vasoconstrictive agent (likely to be used). The total quantity and concentration, which may go much beyond dangerous limits as in relation to age, stature, fitness, and weight etc. is hazardous.
- 2) Rapid absorption from highly absorptive area or as a result of local Vasodilatation may cause a danger.
- 3) Accidental injection into a main vessel.
- 4) The subject may be hypersensitive to the particular drugs or a mixture of it.

⁴⁶ Constitutional Validity of Narco-Analysis Test under Article 20(3) of the Constitution of India with reference to Judicial Pronouncements available at <http://www.oijrj.org/oijrj/March2014-special-issue/54.pdf> (visited on 21 August 2014).

- 5) It becomes a hazard where Adrenaline is being injected close to an end due to error.
- 6) The general effect of any or the error or negligence, the central nervous system may behave exitory resulting in convulsion, or it may become danger to life from respiratory paralysis. In a remote chance the heart may also be affected.⁴⁷

5.8 Narco-Analysis test and its application in Criminal Justice System: An Overview

5.8.1 Significance of Narco-Analysis test in Medical Science: An Appraisal

The deception-detection test (DDT) such as Narco-Analysis test have important clinical scientific, ethical and legal implications⁴⁸. Narco-Analysis has been used in the mental health cases for diagnosing the ailment. Its role is therapeutic and also interventional. Narco-Analysis is done for understanding psychodynamics behaviour of patient. It also help in understanding the psychological realities about the patient. In the medical field, Narco-Analysis is used for (1) for restoring speech to mute person, (2) in cases of amnesia, for reviving memory and (3) for expression of suppressed or repressed thought or conflict.⁴⁹

For a psychiatrist, the distinction between amnesia and malingering is important. Narco-Analysis is not very helpful in case of malingering. Amnesia is also categorized as assumed amnesia, patchy amnesia or hysterical amnesia. An assumed amnesia is often exposed by some chance remark or written statement of the accused. A patchy amnesia is in which forgotten and remembered event follow each other indiscriminately and it is likely to occur in malingering. The genuine amnesia should not be contaminated by prolonged questioning and by suggestive remarks. Hysterical amnesia is followed by psychic trauma.⁵⁰

Medicine and law are two different and sister profession and everybody needs and uses them in their daily life. When medicine and law combine it becomes medico-legal. Lawyers and judges are aware about it but an average man has no exact knowledge about these two basic professions. Even lawyers who do not deal with

⁴⁷ *Supra* 27, 50.

⁴⁸ P.R. Walpe, K.R Foster, et.al, "Emerging neuro technologies for lie-detection: Promise and peril39-49.s" bioeth, (2005).

⁴⁹ *Supra* 3,373.

⁵⁰ 1977 Senate Hearing on MKULTRA: "Truth" Drugs in Interrogation (The CIA'S Program of Research in Behavioral Modification).

medical issues in their profession know much about medicine .Although it is very much necessary for them to know about it .So in the case with doctors who know very little about law while it is necessary for both to know each other fully well. They do not realize the importance of the other profession .This gap is filled by medico-legal experts and they provide a smooth functioning between the two branches of profession. If doctors do not know about the particulars of law and appear to prove his/her report in court he/she may not be able to answer the question put to him/her by lawyer and judge .Similarly, lawyers who are ignorant of medical vocabulary would fail to defend their client properly .Both get together in court and one's aid is sought by other. Both professions face each other when a person is injured or a narcotic addict is brought to the court or when evidence is presented for the purpose of analysis by a scientist. These are so many answers where both are profession; law and science meet each other.⁵¹

Sodium Pentothal drug is used in Narco-Analysis test is used as an induction agent for the general anaesthesia routinely contemplated in most of the surgeries and the psychiatrists routinely use Sodium Pentothal in the diagnosis and /or to evaluate the psychological realities.⁵²

5.8.2 Significance of Narco-Analysis test in legal science

Now a days, the importance of Narco-Analysis test is increasing with the time. It has great importance at the time of Crime investigation. Infact it has become an integral part of the crime investigation .It is generally thought that by conducting the Narco-Analysis test the truth may be successfully reveal .So the investigating agencies conduct the test for revealing the real truth from the accused person .There are so many cases in which Narco-Analysis test was conducted by the investigating agencies. It is used as a preventive forensic tool to apart the planned crime, bursting the conspiracies it can prove to be a valuable technique to prevent the organised crime in the hand of competent team of expert.⁵³

To find out the answer of the following three question, Narco-Analysis test is conducted on the accused person –

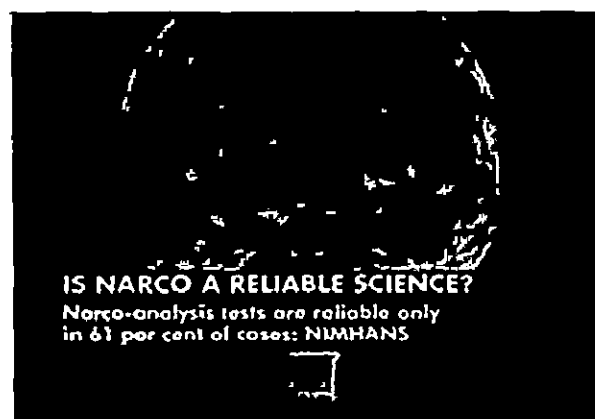
51 Seha Venkatraman titled "Medical Jurisprudence: An Indian law Perspective" available on www.legalserviceindia.com (visited on 24-17-2013).

52 *Supra* 3,415.

53 *Ibid.*

- (a) What is revealed in Narco-Analysis test?
- (b) What is evicted in Narco-Analysis test?
- (c) What is the outcome of Narco investigation?

In the first category, the person is accused because of enough material evidence and only some links are missing to connect the crime to the accused. In second category, he is an accused because of circumstances. In the third category, he is only a suspect because of the complaint and witnesses statement and there is no material evidence⁵⁴. Narco-Analysis test is basically practised by the psychiatrist to diagnose and treat the mentally ill subjects so that they can exactly know the psychological truth about the subject who is not able to reveal it. But at present, it is used by police as a method for investigation. In police investigation physical coercion has been substituted for pain staking and time consuming inquiry in the belief that direct method produce quick result.⁵⁵ Sir James Stephen has well defined the practice of employing physical force and coercion during police investigation. While elaborating it in 1883, he lamented following word-“it is far pleasanter to sit comfortably in the shades ,rubbing red pepper in a poor devil’s eyes than, to go about in the sun hunting up evidence .At present Narco-Analysis test is conducting by police authorities in place of third degree method on suspect ,which seems much humanitarian method. Through these tests, the investigation officers are much concerned about the empirical facts or truth rather than psychological one so that it can be used against the suspect as evidence.⁵⁶



54 S.L. Vaijia, "Narco-Analysis –an aid to crime investigation" available at www.legalservice.com(visited on date 14-11-2013).

55 Rajesh Punia "Narco-Analysis-Investigating Tool or A Torture?" 115Cri.L.J.22 (2009).

56 A.K.Kala, of ethically comprising position and blatant lies about 'truth serum', 49 Indian J. psychiatry 6-9(2007).

According to J.M. Donald, Psychiatrist, District Court of Denver⁵⁷ says that drugs interrogation is of doubtful value in obtaining confession to crime. Criminal suspect under the influence of barbiturates may deliberately without information, persist in giving untruthful answer or falsely confess to the crime they did not commit. The psychopathic personality, in particular, appears to resist successfully the influence of drugs. He concluded that a person who gives false information prior to receiving drugs is likely to give false informations under the effect of Narco-Analysis also, that the drugs are of little value for revealing deception and they are more effective in releasing unconsciously repressed material than in evoking consciously suppressed information.

In India, like other countries Narco-Analysis test is also conducted by police officer for assistance in extracting confession from the accused person. In India where drugs have gained only marginal acceptance in the police work, their use has provoked cries of “psychological third degree” and has proved to be a scientific method of interrogation, on other hand such drugs are used in Narco-Analysis test. However it has been in the news in the past few years as new effective interrogating techniques which was used by various investigative agencies in many cases. For example it was first used in 2002 in case of Godhra Carnage probe, in 2003 in case of Abdul Karim Telgi, Arushi murder case, Nithari case etc. In this way, it has wide importance in the field of legal science. Doubt have been cast on its reliability and legal validity i.e. admissibility in the court of law. The application of Narco-Analysis test involves the fundamental question pertaining to judicial matter and human rights. However, the legal position of applying this technique as an investigative aid arises genuine issues like encroachment of an individual’s rights, liberties and freedom. With crimes going hi-tech and criminals becoming highly trained professionals, the use of Narco-Analysis by the investigating agency can be very useful, because whereas the conscious mind does not speak out the truth, unconscious may reveal the information, which could provide vital lead in. Even under the best condition, these tests could result in an output contaminated by deception, fantasy and garbled speech.⁵⁸

57 J.M. Mac Donald, “Narco-Analysis and Criminal Law”, A.M.J.Psychiatry 1954:111:283.

58 Kalvakota Srinivas Rao “Narco-Analysis” ALTJ 14 (2008).

5.8.3 Application of Narco-Analysis test in Criminal Justice System-An Appraisal

The Criminal Justice System has an alarmingly low conviction rate and the situation desires to be rectifying with importance on actual science and state of the thing and technology. The Central Government must make a clear policy stands on Narco-Analysis .The legal system should imbibe the developments and advances that take place in science as long as they do not violate the fundamental legal principles and are good for the society. Narco-Analysis, for the criminal interrogations has proved to be a valuable technique, which greatly affects both the innocent and the guilty and thereby hasten the cause of justice. The manner in which modern day criminals make use of science and technology in perpetrating their criminal activities with the relative impunity has compelled a rethinking on the part of the criminal justice establishments to seek to the help of the police ,prosecutors and the courts.⁵⁹

Every government whatever be its form, must uphold the law and maintain in the society which it govern .These are the basic functions which is essentially done through what is called “Criminal Justice System”(CJS).As per Oxford dictionary ,the term ‘system’ means “set of connected things or parts” or “set of organ of body with common structure or function”. Criminal Justice System (CJS) is the combination of various organs of the Government, entrusted with the job of ensuring justice to the people. The functioning and the efficacy of this system is the backbone for the very foundation of any societies.⁶⁰

With the rapid increase in the activities of modern state, individualisation and changes in the socio-economic and political scenario, more and more new crimes are coming up such as the custodial crimes, insurgency, terrorism, organised crimes, political crime and cyber crime etc apart enomorous increase in the traditional crimes like murder, rape, cheating, dacoity, domestic violence against women and children etc. The Criminal Justice System has failed to deliver proper justice to people at large. The different sub-system of Criminal Justice System has not been able to meet their goals and people have lost their faith in the existing Criminal Justice System.⁶¹

⁵⁹ www.supreme courtcases.com visited on date 06-11-13.

⁶⁰ CBI Bulletin, Vol. XII, Jan.2004, 14.

⁶¹ The Indian Journal of Criminology and Criminalistic, VolXII, May-Aug.2003, 1.

Justice Gajendragadkar made the following observations in 58th report of law commission of India which is quite noteworthy:

“We have sound judicial tradition and a rational and systematic judicial process. There is no doubt that these factors have conferred great advantage on the country. An independent and efficient judiciary, a unified judicial system and a modernized procedure use though legacies of the pre-independence era, have always been cherished by us. The judicial system has earned in respect so earned is well deserved.”⁶²

Science and Technology are the modern-day engines of change and they continue to turn relentlessly forwarded. The impact of change on all areas of human life has been dramatic. Advancing technologies, along with the legislation designed to control it, will create crimes never before imagined. The future will see a race between technologically sophisticated offenders and law the enforcement authorities as to who can wield the most advanced skill on either side of the age-old battle between crime and justice.⁶³

The present technique of Narco-Analysis test is now being used rampantly in Criminal Justice System. It is a effective technique with which help the crime can easily solved. In Criminal Justice System Narco-Analysis test is used for the investigation purpose. According to Dr. S. L Vaya, Deputy Director of DFS, Gandinagar, Gujarat, “Narco-Analysis” is a useful and non invasive asset for the investigation and for the prevention of crimes and if used in a scientific way, it can be very useful for the thorough interrogation of the suspect. There are so many other methods for interrogation of the suspects such as third degree methods, Polygraph examination, psychological profiling, electrical activation and hypnosis. But Narco-Analysis has so far proved to be test methods of all.⁶⁴ Technology and Science are the modern-day engine of change, and they continue to turn relentlessly forward. The impact of changes in all areas of human life has been dramatic. Advancing technology, along with legislations designed to control it will create crimes never before imagined .The future will see a race between technologically sophisticated

⁶² *Id.*p.7

⁶³ Schmallegger Frank, *Criminal Justice Today, An Introductory Text for the Twenty-First Century* 64,Fourth Edition ,1997.

⁶⁴ Satyendra Kaul and Mohd. H. Zaidi, *Narco-Analysis, Brain Mapping, Hypnosis & Lie Detector Test, An Interrogation of Suspect 438*(Alia Law Agency, Allahabad 2008).

offences and law enforcement authorities as to who can wield the most advance skill on either side of the age-old battle between crime and justice.⁶⁵

It is used for investigation purpose in criminal justice system. In the matter of criminal cases the accused is asked to submit himself or herself for Narco-Analysis. This test should not be used in all cases. It should be used in such cases where the interest of society at large is involved. In case of terrorist activities also it could be used for reading the brain of the suspect to avoid further terrorist activities.⁶⁶

Narco-Analysis test has been successfully conducted on the accused person in the various criminal cases.

The Gujarat H.C. has held in *Santosh Sharmanbhai Ladeja v. State of Gujarat*⁶⁷, that the Narco-Analysis test is basically conducted under the supervision of doctors and proper care is taken and there is observation of the state of the accused and as such, the element of risk is minimal risk is in fact part of life and pervades in most of human activities and on this ground alone, therefore, the impugned test cannot be condemned.

In *Abhay Singh v. State of U.P.*⁶⁸ It was held by Justice Barkat Ali Zaidi that hairs and nails of the accused can be taken for utilisation during the investigation even if the accused does not agree for the same. If that invasion of the accused is permissible, the principle should be applicable to Narco-Analysis and Brain mapping Tests also. It means that other scientific test may also be conduct on the accused person without his/her consent. The discovery of the truth is the desideratum of investigation ad all efforts have to be made to find out the real culprit, because one guilty person, who escapes, is the hope of one million .Court have therefore to adopt a helpful attitude in all efforts made by the prosecution for discovery of the truth .If the Narco-Analysis and Brain-Mapping test can be helpful in finding out the facts relating to the offence, it should be conduct on the accused person..⁶⁹

In *Selvi Murugeshan v. State of Maharashtra*⁷⁰ Kavita Murugeshan, wife of Shiv Kumar and daughter of Selvi Murugeshan, a T.N sitting MLA lodged an FIR

65 *Supra* 62, 68.

66 *Supra* 45,438.

67 2007 criLJ4566.

68 2009 Cri.L.J2189 (All) LK Bench.

69 *Ibid.* ,2190.

70 2004(7) KarLJ501.

that her parents and their friend Govindraj, president of MGR Fans' Association and President of Erode District unit of AIADMK have murdered of her husband She had charged her parents for the murder of her husband as she has made love marriage with him ,who belonged to the other caste ,against the wishes of her parents .The victim was kidnapped while he was walking with his wife (the complainant)and next day he was found murdered at a field in attebele Police Station limit in Bangalore rural district. His head was smashed with a boulder and he was identified by his driving licence.

In this sensational case, the investigating agency made demand from the court for conducting Narco-Analysis test. In this case, the question before the court was that whether conducting of Narco-Analysis test on the accused person will be a violation of Article 20(3) of Indian Constitution? It was held by the Court that it will be depend upon the nature of the question which are to be asked from the accused person. Whether the statement made or any information given by the accused person will be either exculpatory or inculpatory and it is only inculpatory statement which is hit by the Article 20(3) of the Constitution. Whether the accused make inculpatory or exculpatory statement will be known only after the test is conducted and not before that. Therefore, it is premature to say regarding the nature of the statement or the information which the accused gives under Narco-Analysis test. Collection of evidence is permitted under the law by the police officer. Conducting the Narco-Analysis test on the accused person is also part of collecting the evidence. It was further held by the court that this test should be performed in the presence of expert team of doctors. In this case, court permitted the authority for conducting the Narco-Analysis test. The Narco-Analysis test showed the involvement of Selvi Murugeshan and her husband but they were let off due to the lack of other evidences.

In *Ranjit Singh Brahamjeet Singh Sharma v. State of Maharashtra and Another*⁷¹ which is also known as Abdul Karim Telgi case, the accused person was involved in the fake stamp paper case. The accused person was brought for the Polygraph test .He was first interviewed and interrogated and it was found that he was concealing some relevant information .It was also found that he was also suspected to be lying about involvement of politician and police officer in fake stamp papers .On next day he was produced for brain mapping test. It was held by the court regarding

71 AIR 2005 SC 2277.

the report of admissibility of brain mapping test that no material placed on report to show as to how far the report can be relied on. Whether the scientific tests are admissible or not, will depend upon its genuineness .whether the brain mapping test is so developed that the report so as to enable a court to place reliance on it, is a matter which requires further consideration. In this case, the court left the question undecided about the admissibility of the brain mapping test.

In *Ramachandran Reddy v. State of Maharashtra*⁷², Bombay H.C. upheld the legality of the use of P300 or Brain mapping and Narco-Analysis test .It was held by the court that the evidence produced under the effect of Narco-Analysis test is admissible. With the passing of the time as crimes are going hi-tech, the criminals become professionals, who are taking new techniques into consideration in committing the crimes. So the use of Narco-Analysis has really been significant in detecting the crime. It was further s held by the court that this test involve minimal bodily harm.

In the case of *State of A.P. v. Inapuri Padma*⁷³, it was held by the Andhra Pradesh High Court that where the petitioners are not the accused arrested by the court, there is no need to obtain any permission from the court to undergo Narco-Analysis if they express no objection to undergo the same. Where the witnesses are not willing to undergo the test, the police is required to seek the permission from the court as to what the circumstances that made the police gain the impressing that there is likelihood that the person proposed to put test knows something about the commission of the offence.

In the famous case of *Santokhben Sharmanbhai Ladeja v. State of Gujarat*⁷⁴, the Hon'ble Gujarat High Court has held that the Narco-Analysis test is conducted under the supervision of competent doctors and with proper care and as such ,the element of the condition of the accused risk is infact part of life and pervades in most of the impugned test cannot be condemned .In this case the question before the court that whether the conducting the Narco-Analysis test and Brain Mapping test is violative of Article 20(3) and Article 21 of Indian Constitution .It was held by the court that conducting the Narco-Analysis test or Brain Mapping test on the accused

72 2004 All MR (Cri) 1704.

73 2008 CriLJ 68.

74 2008Cri.L.J.68.

person is the part of the investigation and for investigation there is no need to take permission from the court . Under Criminal Procedure Code, there is no provision given about taken permission from the court for investigation. Thus it cannot be said that only conducting the Narco-Analysis test and brain mapping test on the accused is violative of Article 20(3) and Article 21 of the Indian Constitution.

Likewise in *Abhay Singh v. State of U.P.*⁷⁵, it was held by Justice Barkat Ali Zaidi that it is now well settled that hairs and nails of the accused person can be taken for utilization for investigation even if the accused does not agree for the same .If that invasion of the accused is permissible, the principle should be applicable to Narco-Analysis and Brain Mapping tests also. The discovery of truth is the desideratum of out the real culprit, because one guilty person, who escapes, is the hope of one million. The Courts have therefore to adopt a helpful attitude in all efforts, made by the prosecution for discovery of the truth .If the Narco-Analysis and Brain Mapping test can be helpful in finding on the facts relating to the offence, it should be used and utilized and courts should not obstruct the conduct of the exercise.

Recently in the well known case of *Surender Koli v. State of U.P. and Others*⁷⁶, Surender Koli was the main accused in the Nithari case. In this case Narco-Analysis test was conduct on the accused person on January 2007 in Forensic Science Laboratory, Gandhinagar to aSectionrtain the veracity of their statement made during their custodial interrogation. During the test various confessional statement were made by the accused person under the effect of the drugs .During the test, the accused person reveal the names of various females and children which were murdered by the accuse person. On the behalf of the test and various other evidences Supreme Court upholds death penalty for Nithari's accused.

In *Rojo George v. Deputy Superintendent of Police*⁷⁷, the CBI can compel the suspect to undergo the polygraph test and Narco-Analysis test for revealing the truth. The suspect raised the plea that the proposed Narco-Analysis test is extremely problematical test which conducted after administering sodium pentathol due to which the central nervous system effect, heart rate slows and blood pressure low. It is further averred that it is very difficult to determine the correct dosage of the drug to be

75 2009CrILJ2189(All)LKO Bench.

76 AIR 2011SC 970 .

77 2006 (2)KLT 197.

administered on a subject since the same varies according to the age, sex, physical constitution and also mental attitude and will power. It is further averred that a wrong dose could send a subject into coma or even cause death. It is further averred that the petitioner apprehends that if he is subjected to Narco-Analysis at this young age of 24, it will have far reaching consequences on both his physical and mental constitution. It is averred that the attempt of the CBI is to fasten the criminal liability in the above crime to someone. It is also that averred one Krishna Pillai confessed that he committed the offence. But the officers are not prepared to investigate whether that confession is true or not. The petitioner whole heartedly co-operated with the Investigating Agency while conducting brain mapping as well as polygraph test but the Investigating Agency was not able to collect any material. According to the petitioner Investigating Agency is bound to follow the procedure established by law even in the case of a suspect. He may not be compelled to undergo the test without an undertaking from the Investigating Agency that no adverse consequences will result by undergoing that test. It is also averred that subjecting a person into Narco-Analysis will amount to violation of the fundamental right guaranteed to the petitioner under Articles 20(3) and 21 of the Constitution of India.

It was held by the court in this case that Narco-Analysis is a scientific test conducted by the experts in the subject after taking all possible precautions. It is true that it has got adverse reactions also. But such adverse reaction can happen while administering any medicine prescribed by doctors practicing modern medicine. So merely because there is a remote possibility of adverse reaction, use of such techniques in conducting investigation cannot be prevented. It is argued that recording of a statement of a person undergoing Narco-Analysis will amount to testimonial compulsion and the same is violative of Article 20(3) of the Constitution. The protection against compulsion to be a witness is limited to persons accused of an offence. There is no constitutional protection to persons other than the accused. The immunity under Article 20(3) does not extend to compulsory exhibition of the body or giving blood specimen. The court's considered view is that the same principle should apply to Narco-Analysis also because it is also a scientific test conducted by a team of scientists and not will amount to custodial interrogation by Police. In present days the techniques used by the criminals for commission of crime are very sophisticated and modern. The

conventional method of questioning may not yield any result at all. That is why the scientific tests like polygraph, brain mapping, Narco-Analysis, etc. are now used in the investigation of a case. When such tests are conducted under strict supervision of the expert, it cannot be said that there is any violation of the fundamental rights guaranteed to a citizen of India.

5.9 Constitutional Validity and Evidentiary Value of Narco-Analysis Test

Law is for society and the society for law .Law has to keep with the changing social order because of evolutionary ethos of society .Judiciary has as an important organ of government, the responsibility of interpreting the law for the greater good of the society viewed in this proper perspective, judicial mind must remain in touch and be abreast of advancement of humanity. For combating emerging organised crimes having refined overtones, its detection, investigation and preventive method have to be used synchronously.⁷⁸

Admission and confession form an integral part of evidence whether in a civil or in a criminal one and can therefore be relied upon for proving the truth of the fact, incorporated therein. Since admission are an important piece of evidence .It is open to the person who made the admission to prove that those admissions are true .Even if proved to be true ,admission are not conclusive but would be decisive of the matter.⁷⁹

The expanding horizon of science and technology has thrown new challenges to lawyers and judges dealing with the proof of fact in disputes, where advanced techniques in technology have been used.⁸⁰The use of technology under civil and criminal law does not restrict itself to the production of evidence for admission in the courts .With the growth in technology ,the method of availing such confession is expanded from using lie detector to the using of truth serum which also called Narco-Analysis .

One of the fundamental principles of administration of criminal justice is based on the maxim *Nemo Tenetur Seipsum Accusare* that means “no man is bound to accuse himself”. Article 14(3) (g) of the International Covenant on civil and Political

78 Manpreet Singh ,”*Constitutional Validity of Brain-mapping and Narco-Analysis Test* “301PULJ (2011).

79 Cri.L.J2011, 121.

80 National Textile Workers Union v. PR Ramakrishna AIR 1983SC.

Rights also provides the rights, “not to be compelled to testing against himself or to confess guilt”. In Britain it is a fundamental principle of the common law that a person accused of an offence shall not be compelled to find out document or object, which incriminates him. The privilege is based on the policy of encouraging person to come forward with the evidence in the court of justice by protecting them as far as possible from injury or needles annoyance in consequence of so doing .the Fifth amendment of the U.S Constitution also provides protection against self incrimination by stating “no person shall be compelled in any criminal case to be a witness against himself.”⁸¹

The Constitution of India has clearly stated under Article 20 (3) that a person cannot be compelled to be a witness against himself .The provision operates as a shield against the compulsion of testimony .It established the preposition that –

- (a) Accused is presumed to be innocent
- (b) Prosecution has to establish his guilt
- (c) Accused need not make any statement against his will.

This provision of the Constitution has provided due protection against such compulsion “to be a witness” and protection against such “compulsion” resulting in his giving evidence against himself .The protection against compulsion to be a witness is confined to person accused of an offence .There is no Constitutional protection for witness i.e. person other than the accused .However ,the Indian Evidence Act, 1872 ,in Section 132 and 148 confer a limited protection against self -incrimination to witness in civil and criminal courts.⁸²

In *Selvi v. State of Karnataka*⁸³, the SC has laid down the principle about conducting of Narco-Analysis that Narco-Analysis test cannot be conducted on the accused person without taking the consent from the accused person. If such test conducted on the accused person, it would be violative of Article 20(3) of the Indian Constitution. It was further held by the Court that this test should be conducted in the presence of the expert.

81 Charanjiv Singh “Narco-Analysis –Anew Trend in Forensic Science As A Tool of Investigation”240 PULJ(2007) .

82 Rajesh Punia,”Narco-Analysis investigation tool or a torture”115 CriLJ 23(2009).

83 AIR 2010 SC 340.

SC rules against forced Narco, Polygraph & Brain-mapping tests

Narco-analysis test

Narco-analysis is also known as the truth serum test. The subject is administered a chemical in controlled laboratory circumstances under supervision of doctors. This puts the subject in a state of hypnosis. It is believed that during the test inhibitions are reduced and answers cannot be manipulated. The dose of the chemical depends on the person's sex, age, health and physical condition. An overdose can result in a person going into a coma, or even death.



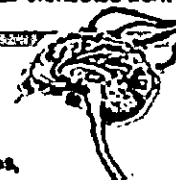
Polygraph test

A polygraph (also known as a lie detector) is an instrument that records several physiological parameters like blood pressure, pulse, breathing, and skin conductivity while the subject is asked a series of questions, with the assumption that misleading answers will produce physiological responses that can be differentiated from those associated with non-misleading answers.



Brain-mapping test

This test is done to find out if a suspect's brain recognizes things related to a crime. The suspect is first interrogated to find out whether he is concealing any information. Sensors are then attached to the subject's head. He is then shown certain images or made to hear certain sounds. The sensors monitor electrical activity in the brain and register 'T300' waves, which are generated only if the subject has a connection with the stimulus provided (images or sound).



K&K Infographics

Supreme Court Verdict on Narco-Analysis, Polygraph and Brain mapping test

The right against self incrimination is designed to prevent the use of law or the legal process to force from the lips of the accused person the evidence necessary to convict him. Though the right has been defined broadly its scope has been confined by judicial interpretation to evidence that is testimonial in nature. In other words, it has been held that the protection is available only to evidence which require a volitional act on the part of the accused person thus rendering it testimonial or communicative in nature and it will not protect taking of blood sample, fingerprints etc from the accused. The protection would be available only from the time the person is charged of an offence.⁸⁴ It does not extend to the pre-accusation or investigation stage, if a strict interpretation of Article 20(3) is done. The immunity will not be available to a person against whom no accusation has been made when a compulsory process or notice is issued directing him under pain or penalty to produce a document though ultimately it may incriminate him for the commission of an offence.⁸⁵ The Constitution incarnation stimulating the ban on self-incrimination has been enshrined in Article 20(3) of the Constitution of India. However, the question that arises today is whether the law enforcement authorities can be allowed to garner truth from every quarter in order to discover guilt and fulfil the final tryst of the justice system with the society. Article 20(3) of Indian Constitution is based upon a maxim i.e. "no man, not

⁸⁴ Constitutional and Evidentiary Validity of New Scientific Test, 49:4Journal of the Indian Law Institute 533.

⁸⁵ A search warrant leading to discovery of contraband is a perfect example.

even the accused himself can be compelled to answer any question, which may tend to prove him guilty of a crime he has been accused of". This right had its origin in a protest against the unjust method of interrogating accused person. The privileged against self-incrimination remain an important safeguard in the criminal jurisprudence. The right given under Article 20(3) is non-derogable basic Human Right and cannot be taken away under any circumstance whatsoever. Even in case of emergency, this right cannot be taken suspended. The provision given under Article 20(3) embodies the principle of protection against compulsion of Self-Incrimination, which is one of the fundamental Canon of the British system of Criminal jurisprudence and which has been adopted by the federal American system and incorporated in the Federal Constitution. The Fifth Amendment of the American Constitution provides that "no person shall be compelled in any case to be a witness against himself".⁸⁶ It has also to a substantial extent, been recognised in the criminal administration of justice in this country by the incorporation into various statutory provisions.⁸⁷

Analysing the terms, in which the guarantee is contained in our Constitution, it may be stated to consist of the following three components-⁸⁸

- It is a right pertaining to a person accused of an offence.
- It is a protection against compulsion to be a witness, and
- It is a protection against such compulsion resulting in his giving evidence against himself.

Article 20(3) would not include signature, thumb impression, impression of the palm or foot or fingers, or specimen of hand writing, or exposing a part of his body by an accused for the purpose of identification. This does not amount to furnishing evidence against himself.⁸⁹ The self-incrimination must mean covering information based upon the personal knowledge of the person giving the information and cannot include merely the mechanical process of producing document in court which may throw light on any point in controversy, but which do not contain any

⁸⁶ V.N. Shukla, *Constitution of India* 160, (2007).

⁸⁷ Section 342 and SS 5 and 6, Indian Oath Act, 1873.

⁸⁸ Delhi Judicial service Ass. v. State of Gujarat (1919) 4 SCC, 406, 431.

⁸⁹ Uttar Pradesh v. Boota Singh, AIR 1978 SC 1770.

statement of the accused person based on his personal knowledge.⁹⁰ The Narco-Analysis, P300 or Brain Mapping and lie detector tests are the main tests which are conducted by Forensic Experts. In case of lie detector and Brain Mapping test, the prior permission of the court is not required to be taken because in these tests, injection of any drug is not involved where in Narco-Analysis test, the subject is given an injection of a drug under the supervision of anaesthetist so the prior permission of the court is required. The Narco-Analysis test was subjected to great criticism by defence lawyers by whom it was termed as violation of Article 20(3) of Indian Constitution, but it has been permitted to be conducted on the accused person by various High Courts. in India and it has been found to be very convicting .The argument about violation of Constitution has been repelled by holding that rights under Article 20(3) is not absolute.⁹¹ In this test the statement made by the accused person are recorded on audio and video cassettes, and the reports of the expert is helpful in collecting evidence.

In case of *state of Bombay v. Kali Kathu Oghad*⁹², it was held by the Supreme Court that taking a thump impression or impression of palm or foot or fingers or specimen writing or exposing a part of the body from an accused person for purpose of identification is constitutionally valid. In this case it was further held by the Supreme Court that the self-incriminating statement given without threat would not attract Article 20(3) of the Constitution of India because it was not given under compulsion. It was also said by the court that mere fact that the accused was in police custody does not by itself imply that compulsion was used for obtaining the specimen hand writing. Even if there is compulsion, it does not amount to testimonial compulsion.

In case of *M.P. Sharma v. Satish Chandra*⁹³, the decision was given by a Constitutional Bench of 11 judges of Supreme Court. In this case it was held by the court that protection under Article 20(3) of the Indian Constitution is available to a person against whom a formal accusation relating to an offence is pending. It would mean that if an FIR has lodged against a person then the protection would be available. It was contented before the Supreme Court that the guarantee in Article

90 M.P. Jain, Indian Constitution law569 (Fourth Edition, reprint, 2000).

91 *Supra* note 3,p.408.

92 AIR 1951 SCI 808.

93 AIR 1954 SC 300.

20(3) of the Constitution against testimonial compulsion is confined only to oral evidence of a person standing his trial for an offence when he is called to the witness-stand. Rejecting this contention, the Supreme Court has said that there is no reason to confine the content of the constitutional guarantee to its barely literal import and therefore, to limit it would be to rob the guarantee of its substantial purpose and to miss the substance for the sound as stated in certain American decision.

The taking of impression of part of the body of an accused person very often becomes necessary to help the investigation of a crime. It is as much necessary to protect an accused person against being compelled to incriminate himself as to arm the agents of law and the Courts with legitimate power to bring offender to justice. Furthermore, it must be assumed that the founding fathers of Constitution were aware of the existing laws, for example Sec 73 of the Indian Evidence Act 1872 or Sec 5 and 6 of Identification of Pensioners Act (XXXIII of 1929). Hence the underlying principle behind the judgement⁹⁴ that declared P300 and Polygraph testing as Constitutionally valid as it is reasonable and require no statement to be made by the accused .Furthermore ,its arms the agent of law and the law courts with legitimate power to being offender to justice.⁹⁵

In *Nandini Sathpathi v. P.L.Dani*⁹⁶, it was observed by the Apex Court that in order to bring the evidence within the self-consciousness of clause (3) of Article 20 it must be shown not only that the person making the statement was an accused at the time he made it and it had a material bearing on the criminality of the maker of the statement ,but also that he was compelled to make that statement under compulsion in the context must mean what in law is called duress .In the dictionary of English law by Eart Jawitt duress is explained as follows:-

“Duress is where a man is compelled to do an act by injury, by beating or unlawful imprisonment (sometimes called duress in strict sense) or by the threat of being killed, suffering some grievous bodily harm or being unlawfully imprisonment (sometime called menace or duress per minas). Duress also includes treating, beating or imprisonment of the wife, parents or child of a person.”

94 Ramachandran Reddy v. state of Maharashtra Cr.W.P.No.1924 of 2003 decided on 5-3-2004, Bom. H.C.

95 Constitutional and Evidentiary Validity of New Scientific Test, 49 Journal of Indian Law Institute 537, (2007).

96 AIR 1978 SC1025 at 1032.

The compulsion is in the sense of physical objective act and not the state of mind of the person making the statement, except where the mind has been so conditioned by the some extraneous process as to render the making of the statement involuntarily and therefore, extorted.

By the various High Courts of India it has been decided that Narco-Analysis test is a valid test and it does not violate Article 20 (3) of the Indian Constitution like that of the Bombay, Madras, Kerala, Gujarat, Andhra Pradesh and Allahabad. Moreover they have held that the Narco-Analysis test and the use of P300 or Brain fingerprinting, lie-detector test and use of mouth serum to be perfectly valid under Article 20(3) of the Indian Constitution.

Similarly in *State of A.P. v. Inapuri Padma*⁹⁷, it was held by Andhra Pradesh High Court that where the petitioners are not the accused but arrested by the order of the court, there is no need to obtain any permission from the court to undergo Narco-Analysis test if they express no objection to undergo this test. Where the witnesses are not willing to undergo the test, the police has to convince the court as to what are circumstances that made the police to gain the impression that there is likelihood that the person proposed to be put to test knows something about the commission of the offence.

In the famous case of *Mohinder Singh Pandher and Surender Singh Koli v. State of U.P.*⁹⁸, which is also known as **Nithari Murder case** Narco-Analysis test was conducted on Surender Koli and Mohinder Singh Pandher in Jan 2007, who were the main accused in the famous Nithari Murder case. This test was basically conducted in the Forensic Science Laboratory in Gandhinagar. This test was basically conducted to ascertaining the veracity of their statement during their custodial interrogation. During this test, the accused person disclosed the name of various females and children who had been murdered by them and also revealed his argue to rape them after murdering them. By the conducting of this test many relevant information were disclosed to the investigating authorities.

In *Dr. Rajesh Talwar and Another v. Central Bureau Investigation through its Director and Other*⁹⁹, which commonly known as Arushi Murder case. In this case

97 2008 CriLJ. 3992 (AP).

98 AIR 2011 SC 970.

99 2013(83) ALLCC 283.

Arushi, a 14 year girl was found to be dead in the home on 16-05-2008. The report was made by the parents of Arushi in the police station .In this case Hemraj, who was a domestic servant in the house of Arushi, was suspected of murder of Arushi .But after two days the dead body of Hemraj was also found on the terrace of the house of Arushi .The parents of Arushi were arrested by the police. In this case Narco-Analysis test, Polygraph test and Brain mapping test was conducted on the accused person. It was pleaded before the court that the report of these tests cannot be taken as an evidence in the court of law .It was held by the court on behalf of the judgement of *Selvi v. State of Karnataka* that such tests cannot be conducted by the authority if the consent has not been given by the accused person .Trial court held that the result of tests cannot be admitted as an evidence because the subject does not exercise conscious control over the responses during the conducting of the test .

In the case of *Sasntokhben Sharmanbhai Ladeja v. State of Gujarat*¹⁰⁰, the Gujarat High Court held that “the Narco-Analysis test is conducted under the supervision of doctors and proper care is taken and there is consent, observation of the State of the accused, and ,as such ,the element of risk is minimal .Risk is in fact part of life and pervades in most of human activities and on this ground, alone, therefore, the impugned test cannot be condemned .

In *Abhay Singh v. State of U.P.*¹⁰¹, it was held by Justice Barkat Ali Zaidi that “it is now well settled that hairs and nails of the accused cannot be taken for the utilization during the investigation even if the accused does not agree for the same. In this case the application was moved by the investigating authority for conducting the Narco-Analysis test and brain mapping test of the accused person. It was the question before the court that whether the accused may be compelled for the Narco-Analysis and Brain Mapping test against his will. It was held by the court that the investigation and all efforts have to be made to find out the real offender, because, one guilty person, who escapes, is the hope of one million .If the Narco-Analysis test and Brain mapping test may be supportive in finding out the facts relating to the offence then it should be used and the court should not impede the conduct of the exercise.

100 2008CriLJ 68(Guj.).

101 2009 CriLJ 2189(All)(LKO Bench).

In Criminal Justice System, forensic science occupies a very significant place and it is admissible in the courts. Section 53(1) of Cr.P.C. (Criminal Procedure Code) provides for the medical examination of the accused by the medical practitioner at the request of the police officer. According to Section 53(1) of Criminal Procedure Code – “when a person is arrested on a charge of committing an offence under such circumstances that there are reasonable grounds for believing that an examination of the person will afford evidence as to the commission of an offence, it shall be lawful for a registered medical practitioner, acting at the request of the police officer not below the rank of sub-inspector, and for any person acting in good faith in his aid and under his direction, to make such an examination of the person arrested as is reasonable necessary in order to ascertain of the facts which may afford such evidence, to use such force as is reasonably necessary for that purpose”.

Through this Section the forensic science gets an entry into the field of criminal investigation. The recent Amendment of 2005 made to Section 53 of Criminal Procedure Code apart from others is positive and protective towards the recognition of the importance of scientific tests which include Narco-Analysis, Brain mapping apart from others.¹⁰²

By virtue of Section 161(2) of Criminal Procedure Code, the legislation has protected the citizen's rights against self-incrimination. According to Section 161(2) – “every person is bound to answer truthfully all questions put to him by a police officer, other than questions the answers to which would have a tendency to expose that person to a criminal charge, penalty or forfeiture”. The right to silence has been granted to the accused and no one can forcibly extract statements from the accused who has the right to keep silent during the course of investigation.

Section 39 Cr.P.C. also casts a duty upon any person to give relevant information to the police. This Section as well as other Sections relating to information to investigators have not been held unconstitutional. For effective and efficient investigation, such a power to an investigator appears to be necessary for bringing the criminals to justice.

¹⁰² Gunjan Agrahari “*Narco-Analysis P300 Test: its object and evidentiary evaluation*” 3 CrLJ72 (2007).

It can be easily inferred from the bare reading of the aforesaid Section along with the explanation that the term 'examination' used in the explanation is very wide to include modern scientific techniques of investigation including DNA Profiling and Narco-Analysis test. A similar type of argument was advanced by Solicitor General Goolam E Vahanvati in a pending case before a Bench comprising of Chief Justice K.G. Balakrishnan, Justice R.V. Ravindram and Justice Panchat Vahanvati appearing as amicus curie justified the use of these three tests, saying that they have legal mandate under Section 53 of Criminal Procedure Code which lists a host of various modern techniques like DNA Fingerprinting and collection of blood sample as perfectly legal tools to probe a crime. He argued that the term "such other test" occurring in the explanation note of the Section 53 include are properly considered to be step in the aid of investigation and not for obtaining incriminate the statements there is no constructional infirmity whatsoever, said Vahanvati. These tests are scientific methods in furtherance of investigation. All these tests are considered to be the part of the process of collection of some subsequent evidence. These tests may provide some clue to the investigating agency to collect some evidence but the statement given by the accused themselves during these tests do not have any evidentiary value to clarify the law officer.

5.10 Narco-Analysis test and Indian Evidence Act

A human being is capable to repress by using his thoughts. During the Narco-Analysis test, the subject's imagination becomes neutralized and the reasoning faculty is affected by making him semiconscious. The subject is not in a situation so that he speaks lie by thinking but can answer specific or simple question. In this state, it becomes difficult for him to lie and his answer would be restricted to the facts he is already aware of. His answers are unplanned and accurate as a semiconscious person is unable to manipulate his answer.

It is recognized that 20% of the total number of the individual subjected for Narco-Analysis are found to be innocent. Therefore these techniques not only help to identify the real perpetrator of crime, motive and modus operandi, conspiracies, disfigurement and displacement of evidentiary items etc but also to identify the innocent within a short period of time.

Section 3 of the Indian Evidence Act, 1872 defines Evidence. The question arises whether any answer received as a result of Narco-Analysis test would be evidence or not? Perhaps such answer or statement would not form part of 'evidence' unless it satisfies some other tests. The fact must be clear that whether court has permitted for the test or such test is required by the court or not? It does not become admissible as evidence, if the court has not given permission for the test. Thus the admissibility would depend upon the number of factors.

The provision relating with the admissibility of confession by the accused person in criminal cases has been given from Section 24 to 30 of Indian Evidence Act, 1872. But the expression 'confession' is not defined in the said Act. Mr. Justice Stephen defined confession in his digest of law of Evidence as 'confession' is an admission made at any time by a person charged with a crime stating or suggesting the inference that he committed that crime.¹⁰³ It means that confession is statement made by an accused person admitting his guilt. The term statement includes both oral and written statement. Thus it is clear that the term 'confession' is very wide and it includes oral and written statement. In reference to Narco-Analysis test, it can be said that if the subject orally states or even write down something then both will be amount to confession. But proviso of Section 27 of the Indian Evidence Act would bar statement from being admissible in evidence because if there is the slightest doubt about coercion or intimidation or any type of fear that the statement not free or that immediate before such test, the subject was harassed by the police or was coerced then such statement would be meaningless. Section 24 of the Indian Evidence Act bar such statement.

A combined study of Section 25 and 26 of the Indian Evidence Act is that no confession either made to the police or in custody of police will not be proved against the person accused of any offence. The question arises that if such person has been subjected to weighty and brutal investigation by the police and the element of fear and coercion still exists in his mind and out of this fear, the person (subject) makes a confession of guilt through this test, it will not be acceptable.

The exposure made during the Narco-Analysis test has been found most often to be very useful in solving many significant cases. In most of these cases, the

¹⁰³ Caesar Roy, "Narco-Analysis test- Infringement of individual fundamental rights and its value as evidence" 115 CriLJ, 71 (2009).

statements made have led to the discovery of important informations and consequently various recoveries have been made under Section 27 of the Indian Evidence Act, in large number of cases. Thus it is clear that the information referred to in Section 27 is admissible because it is a voluntary deposition. But if the information has been obtained by the use of compulsion, Article 20(3) will be violated and the information will be inadmissible. The Supreme Court has recognized that the protective scope of Article 20(3) available to the accused in the investigation stage which is also in criminal cases and when it is read with Section 161(2) of Criminal Procedure Code then it will protect the accused and witness also who are examined during an investigation.¹⁰⁴ According to Section 161 (2) of the Cr. P.C. a person is legally bound to answer every question put to him truthfully during the conducting of the test.

The greatest virtue of law is its flexibility and thus its applicability should not be rigid but be flexible. Moreover, law is not static but it is dynamic. Hence it should keep changing according to requirement and changes in society, science, technology, and ethics and so on. The legal system should absorb the developments and advances that take place in Science and others till they are for the welfare of the society and they do not violate the fundamental legal principles. Therefore there is a need that the better refined and sophisticated methods to replace the third degree methods. Narco-Analysis test can evolve as viable effective alternative to the barbaric third degree methods. If a question which does not have the tendency to incriminate the accused succeeds in extracting a confession or statement from him, the usage of the Scientific method cannot be said to violate Article. 20(3) of our Constitution.

Further in the above case it was held that the statements made in custody are considered to be unreliable unless they have been subjected to the cross-examination or judicial scrutiny. No person accused of any offence shall be compelled to be a witness against himself.¹⁰⁵ The confessions made before the police officers are ordinarily not admissible in evidence and it is only the statements made in the confession was a result of any inducement, promise or threat, where charge against the accused person was having some reference. An

¹⁰⁴ Selvi and others v. State of Karnataka AIR 2010 SC 340.

¹⁰⁵ Article 20(3) of the Constitution of India.

accused shall be bound to answer truly all questions relating to such cases put to him by such officer, other than questions, the answers to which would have a tendency to expose him to a criminal charge or to a penalty or forfeiture. The accused shall not render him liable to the punishment by refusing to answer such questions, or by giving false answers to them. The accused shall not be called as a witness except on his own request in writing. His failure to give evidence shall not be made the subject of any comment by any of the Article or the Court or give rise to any presumption against himself or any person charged together with him at the same trial.¹⁰⁶

5.11 Conclusion

The psychiatrists and investigators in most of the civilized countries seldom use Narco-Analysis as it is risky procedure which yield unreliable result .But in India, some investigating agencies resort to this method with the help of forensic scientists and doctors .It is quite possible for the subject to develop fatal or serious adverse effects, if it is not conducted with proper care.

It has become absolutely necessary for the State Governments to work with the Central authorities to improve the investigative abilities of their police departments. The Indian Criminal Justice System has an alarmingly low conviction rate, so there is need of application scientific technique. The Central Government must make a clear policy stand on Narco-Analysis. The legal system should imbibe the developments and advances that take place in science on condition that they do not violate fundamental legal principles and are for the good of the society. Narco-Analysis for criminal interrogation has proved to be a valuable technique, which intensely affects both the blameless and the blameworthy and by this means accelerate the cause of justice which has seen in various cases like the well known Arushi murder case, Nithari killings case, Telgi scam and Mumbai blasts case¹⁰⁷. It is time for our legislature and judiciary to act immediately for the sake of justice and fair procedure to bring Narco-Analysis within the scope of Article 20(3) of the Constitution. The manner in which the modern-day criminals make use of science and technology in perpetrating their criminal activities with relative impunity has

106 "Critical Study on validity of Narco-Analysis with reference to Article 20(3) of the Indian Constitution", *available at*: <http://www.legaltrigger.com/Articles/06.pdf>(last visited on 21 August 2014).

107 *Supra* 90.

compelled rethinking on the essentials of the criminal justice establishment to seek the help of the scientific community to come to the help of the police, prosecutors and the courts. The criminal procedure, rules of evidence, and the institutional infrastructure designed more than a century ago, are now found inadequate to meet the demands of the scientific age. The absence of a national policy in criminal justice administration in this regard, is felt to be a serious drawback.

The conclusion is that Narco-Analysis test is being practiced in India just because of a mutual understanding between the judiciary, police, investigative agencies, human rights activists, etc. Only strong public opinion in support of human rights will be able to influence judicial decisions, and so also the decisions and practices of various professions. A continuous movement should be taken up by the people of India, in the movement for independent rights, against the use of persistent methods like Narco-Analysis test. It is high time that we blend this test with Article 20(3) in such a manner that no questions are raised as to its Constitutional validity. For this purpose, it is essential that the Union Government should come out with certain guidelines which are to be strictly followed while conducting such a test.

Chapter VI

Polygraph Test and its Legal Implication in the Indian Criminal Justice System

POLYGRAPH TEST AND ITS LEGAL IMPLICATIONS IN THE INDIAN CRIMINAL JUSTICE SYSTEM

6.1 Introduction

When we lie, our blood pressure goes up, our heart beats faster, we breathe more quickly (and our breathing slows once the lie has been told), and changes take place in our skin moisture. A Polygraph charts these reactions with pens on a moving strip of paper.... The result is jagged lines that don't convey a lot to you. But...an examiner can tell from those mechanical scribbles whether or not you've spoken the truth.

Polygrapher Chris Gugas

Not every lie involves emotion, but those may cause special problem for the liar. When emotion occur ,physiological changes happen automatically without choice or deliberation .The literature indicate that a person who is lying tends to have a higher pitched voice than truth-teller because of stress .This allows a thorough analysis of the truth about lie-detector .¹

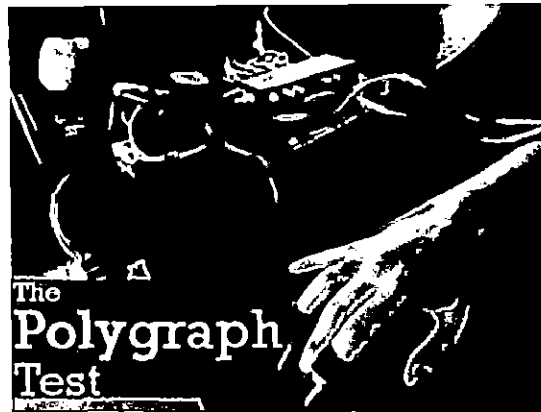
The society owes a commitment to the people that the potential and strength of the states is not abused in the dispensation of justice and that the concept of human right is upheld and nurtured all the time. To preserve the common rights, the basic tool human being has devised is the police set-up. Death, rape and torture in police custody are common, Factual reports have embarrassed several State Government and their police personale which employed third degree methods in the interrogation of the suspected people detained to disclose the truth or their plans. The third degree method will never put an end to the crime as the criminal get hardened and wish to take revenge and cause embarrassment to the establishment. Interrogation of the suspected criminals using third degree methods often results into loss of fear and respect for the authority of the State. The law enforcement agency in the country will have to react effectively by scientific interrogation of the victim and the accused and try to get as much evidence as possible to establish the charge. This is to be done by resorting to forensic polygraphy technique. Forensic Polygraphy is the technique to check deception of truth by a subject juxtaposed with the veracity of his statement.²

1 Dr. Subhas Chandra Singh, "The Truth About lies: Do Lie –Detector Work?"VII CriLJ161 (2007).
2 B.B Nanda and R.K. Tiwari, *Forensic Science in India, A Vision for Twenty First Century*213 (Select Publisher, New Delhi, 2001).

The successful examination and conviction in the criminal cases depends very much on the proper inquiry and the cogent of evidence by the investigating agencies against the suspect. In difficult criminal cases, emotional tests can be exercised by the investigators to cross check their verdicts to conclude whether a suspect is telling the truth or make him disclose facts pertaining a case. A lot of criminal cases have been solved through this technique.

Forensic science in the criminal investigation and trial is mainly concerned with the materials and indirectly through materials with men, places, and time. Among men, the investigation officer is the most important person. In fact, it is he whose work determines the success or failure of the application of forensic science in the processing of a criminal case. For as long as human beings have deceived one another, people have tried to enlarge techniques for the detecting the dishonesty and finding real truth. In today's World, the scenario of impartiality, the conventional sources of proof, eyewitness description, confession have gone much twisted. The trial procedure is very long so it is difficult to keep the witness from turning hostile. At present the criminal are taking in to consideration new techniques in the commission of the crime. So there is a dire need that the prosecution agency rely on something more authentic, more actual and more creative in terms of convictions without the police having to resort to the third degree traditional method that not only violates fundamental human rights but also fail to produce the positive result results most of the time. Recent times have witnessed an epidemic in the use of contemporary scientific techniques such as the Lie Detector, Brain Mapping, and Narco-Analysis, in the criminal investigation.³ Although the legal and decent modesty of their use has been in doubt, they may in fact be a solution to many complicated investigation. There has to be something that is available; objective, and hence not prove to the whims of the witness. The answer is provided as science as by the scientific evidence (lie-detector test) is more or less exact far more reliability and does not turn hostile under threats. Lie Detection took an aspect of modern science with the development in the 20th century of the techniques proposed for the psycho psychological deception, most outstandingly Polygraph testing.

3 "Polygraph Test And its Validity in India", *available at* www.indiakanoon.com(visited on date 11-03-2013).



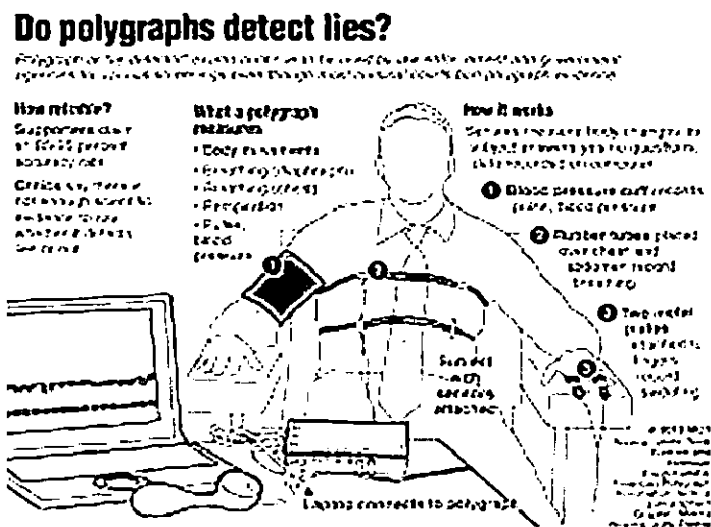
The Polygraph testing or instrumental measures several psychological method (ex. Heart rate) changes in these process. From the chart of those measures in the response to the question on a Polygraph test and sometimes aided by observations during the Polygraph test examiners infer a psychological state, namely, whether a person is telling the truth or is he lying. Nevertheless in India, this technique is not so trustworthy. In India the present day scenario of crime investigation and prosecution of criminals is a sad sight. The scientific basis on which the Polygraph works is that the consciously held feelings of guilt produce a defensive reaction in the form of psychological changes in the blood pressure, pulse rate, respiration rate and in the electrical resistance of the skin known as GSR. Usually the fear of detection and entrapment induces a person to lie. This psychological phenomenon results in the mental excitation. Psychologically, the attempt made by the individual to conceal the excitation, is known as the '**defense mechanism**', which stimulates the adrenal glands, which in response secrete the adrenaline hormone. This hormone, on entering the blood stream, simultaneously increases the blood pressure, pulse-rate and respiration of the individual.⁴

The Courts in India have taken into account an incomplete consideration of the law, which is the reason for their conclusion in favour of the tests. While the tests may be a realistic requirement, the sanction of the law for some of them is difficult to find and extensive safeguards need to be laid out to avoid their exploitation. It is now upon the Supreme Court to define the limits of such tests in the context of the rights affected or vice-versa.

4 Vimla Veeraghavan (ed.), *Handbook of Forensic Science* 107 (Scientific and Selective Publication, 2004).

6.2 Meaning and Definition of Polygraph Test

The term Polygraph refers to a process in which selected physiological activities are recorded. According to the definition of Webster's legal dictionary "a Polygraph is a device for measuring certain involuntary bodily responses, such as blood pressure and perspiration, from which an opinion is drawn as to whether or not the person being tested is telling the truth. Also called, to some extent positively, a Lie Detector. The problem with it is that it may yield accurate opinions in many cases, it may make nervous or confused truth-tellers, and there is no way to know exactly which results are accurate and which are not. Accordingly, Polygraph results are often excluded from the evidence under most circumstances in most jurisdictions and federal laws prohibits employers, from using the device on employees and applicant for employment".⁵



According to Wikipedia, the free encyclopedia available on the net, Polygraph is derived from Greek words 'poly'/'many' and 'refrain/ to write'

In the US Federal agencies, a Polygraph test is also referred to as a "Psychological Detection of Deception" or PDD examination.

There is no Indian legislation which defines Polygraph ,but United States Employees Protection Act of 1988 defines the term 'Polygraph' which means an instrument which-

- (a) Records continuously visually, permanently and simultaneously as minimum instrumentation tendered; and

⁵ Webster's legal Dictionary, by Lames E. Clapp, 197.

- (b) Is used, or the result of which are used, for the purposes of rendering a diagnostic opinion regarding the honesty or dishonesty of an individual.

On the other hand, usually in India the suspects who are being taken by police or other security agencies to the forensic labs for detection of lies and deception, and where it is said that such person is being taken for Narco-Analysis test, generally also put to Polygraph test, but it is not the strict rule. The Polygraph test is so old that it had diminished the credibility in the minds of general public, therefore the police in the West seldom publicly say that the culprit is being taken for polygraph test (rather they say and mention Narco-Analysis test in India).⁶

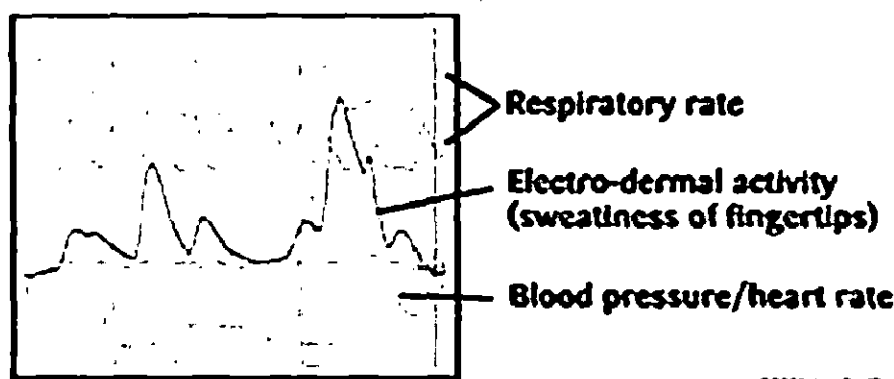
The most significant requirement of a yogin is Speaking truth. Truth is the emperor of intrinsic worth. Truth is the ultimate asset. The essence of the Vedas is Truth. Have power over passions constitutes the real meaning of truth. Truth is virtue. Virtue is light, and light is pleasure. Ahimsa, brahmacharya, transparency, fairness, harmony, pardon, peace are forms of truth. Impartiality, self-discipline, humility, patience, decency, repudiation, deliberation, self-respect, strength, sympathy, and refraining from harm are the various forms of truth. All the above virtues, although apparently dissimilar, have but one and the same form, namely, truth. All these hold up truth and strengthen it. When the path of truth is crushed, the entire additionally also is done. When the root is watered, all the branches are automatically watered.⁷

Lie Detector or Polygraph tests, in additional terms are rarely used in criminal trials. The theory underlying a Lie Detector test is that lying is distressing and that this distress can be calculated and they record on Polygraph machine. The Polygraph is a pneumatically operated device, which concurrently records changes in a subject's blood pressure, pulse, respiration rate and depth, psycho galvanic skin reflex (skin resistance to electrical current) and in some cases the muscular activity. When a subject is put to the 'Polygraph' test (Lie-detector test) the machine reflects and records only the subjects' physiological responses to the questions asked by the operator who then interprets the Polygraph and determines whether the subject is lying or otherwise. The instrument in fact, records the sign of internal stress accompanying deception.⁸

6 Yawer Qazalbash, *Law of Lie Detectors* 61 (Universal law Publication, New Delhi, 2011).

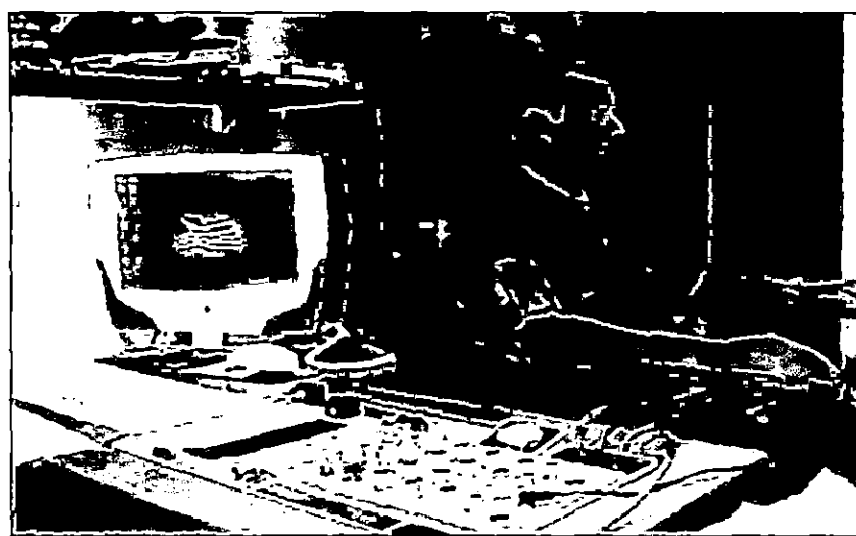
7 Polygraph test and its reliability available at www.ijars.in (visited on date 22-04-2014).

8 Procedure of conducting Polygraph test available at home.total.net (visited on date 27-07-2014).



Measurement of Blood Pressure etc

Modern Polygraph recording has become computerized. This consists of a computer, a combination unit that provides for magnification of the physiological signals and their conversion to the digital form, and a printer.⁹ Lie Detectors are called Polygraph because the test consists of, at the same time, monitoring several suspects psychological functions breathing, pulse, and galvanic skin response and printing out the result on graph paper. The print out shows exactly when, during the questioning period, the biologic responses occurred .If the period of maximum biologic reaction lines up with the solution question on the graph paper the question that would associate the person as being involved with the crime stress is assumed .And along with this assumption of stress comes a second assumption: that the stress indicate a lie.¹⁰

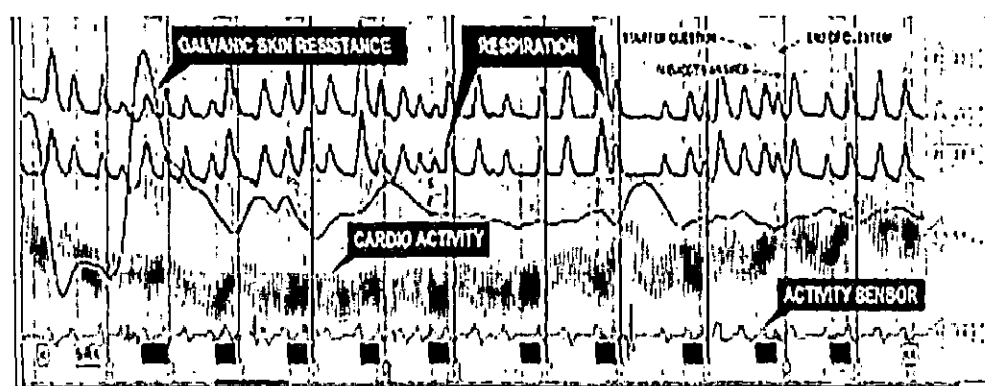


Conducting the Polygraph Test on the Suspect

⁹ *Ibid.*

¹⁰ *Id.*

The Polygraph is a machine that at the same time gauge and chosen psychological behavior or electro psychological behavior. The test is frequently referred to as 'Lie Detector' examination although there is no scientific evidence to verify that machine or test can detect lie or deception .The Polygraph mechanism is used and in gathering psychological data by measuring three method in the corpse or the psychological indicators of excitement .The system or indicator is the rate and depth of respiration at the same time as measured by pneumograph that are in serious situation in the region of the trunk and the stomach .Secondly, cardiovascular activity is measured by a blood pressure cuff. Thirdly, the test of perspiration is being detected by way of electrodes that are attached to the fingertips.¹¹



Measurement of Cardiovascular Activity etc.

6.3 Brief History of the Polygraph Test

The origin of Polygraph test has been traced back to the efforts of Lombroso, a criminologist who experimented with a machine that measured blood pressure and pulse rate to assure the honesty of the person suspected of criminal conduct.¹²

Since the dawn of civilization, mankind has sought ways to distinguish truthfulness from lying in those individuals who are suspected of criminal wrongdoing. Various inventive techniques for the verification of truth and the detection of deception have been tried over the centuries, many of these being ridiculous and cruel. Despite their crudeness, each technique was based on the assumption that some form of physiological reaction occurred within a person when confronted with certain stimuli regarding a specific event under investigation, and that

11 R. Sridhar "Polygraph/Narco-Analysis Testing", PL 15, December (2011), available at www.supremecourtcases.com (visited on date 21-07-2013).

12 Pratibha Banerjee, "Violation of human rights through scientific techniques" CriLJ 108, (2013).

this physiological reaction would, in turn, be manifested in certain recognizable external symptoms that were indicative of honesty or deception.¹³

Polygraphy i.e. the science of truth verification based upon psycho physiological analogues is barely 100 years old. In 1730, British novelist Daniel Defoe wrote an essay entitled "An Effectual Scheme for the Immediate Preventing of Street Robberies and suppressing all Other Disorders of the Night," wherein he recommended that taking the pulse of a suspicious fellow was a practical, effective and humane method for distinguishing truthfulness from lying. Defoe's was an early and insightful suggestion to employ medical science in the fight against crime.¹⁴

In 1878, Science first came to the aid of the truth seeker through the research of Italian physiologist Angelo Mosso. It was then that Mosso used an instrument called a plethysmograph in his research on emotion and fear in subjects undergoing questioning and he studied the effects of these variables on their cardiovascular and respiratory activity. Mosso studied blood circulation and breathing patterns and how they changed under certain stimuli. The use of the plethysmograph revealed periodic undulations or waves in a subject's blood pressure caused by the respiratory cycle in response to certain stimuli. Angelo Mosso was the first scientist to report on experiments in which he observed that a person's breathing pattern changed under certain stimuli, and that this change, in turn, caused variations in their blood pressure and pulse rate.¹⁵

Although not for the purpose of detecting deception, Sir James Mackenzie, M.D., constructed the clinical Polygraph in 1892, an instrument to be used for medical examinations with the capability to simultaneously record undulated line tracings of the vascular pulses (radial, venous and arterial), by way of a stylus onto a revolving drum of smoked paper.¹⁶

Until the end of the 19th century, no measuring device for the detection of deception had ever been used. The first use of a scientific instrument designed to measure physiological responses for this purpose came in 1895 when Italian physician, psychiatrist and pioneer criminologist Cesare Lombroso modified an

13 "Timeline History of Polygraph Test", available at http://home.total.net/~galcar/html/brief_history_of_the_Polygraph.html (visited on date 23-05-2014).

14 *Ibid.*

15 *Ibid.*

16 *Ibid.*

existing instrument called a hydroshygmograph and used this modified device in his experiments to measure the physiological changes that occurred in a crime suspect's blood pressure and pulse rate during a police interrogation.

Notably, Lombroso's early device for measuring pulse rate and blood pressure is similar to the cardiosphygmograph component of the contemporary Polygraph. Although Cesare Lombroso did not invent the hydroshygmograph, he is accorded the distinction of being the first person to have used the instrument successfully as a means for determining truthfulness from deception in crime suspects. On several occasions, he used the hydroshygmograph in actual cases to assist the police in the identification of criminals.¹⁷

In 1906, Sir James Mackenzie refined his clinical Polygraph of 1892 when he devised the clinical ink Polygraph with the help of Lancashire watchmaker, Sebastian Shaw. This instrument used a clockwork mechanism for the paper-rolling and time-marker movements and it produced ink recordings of physiological functions that were easier to acquire and to interpret. Interestingly, it has been written that the modern Polygraph is really a modification of Dr. Mackenzie's clinical ink Polygraph.¹⁸

In 1914, Italian psychologist Vittorio Benussi discovered a method for calculating the quotient of the inhalation to exhalation time as a means of verifying the truth and detecting deception in a subject. Using a Pneumograph, a device that recorded a subject's breathing patterns, Benussi conducted experiments regarding the respiratory symptoms of lying. He concluded that lying caused an emotional change within a subject that resulted in detectible respiratory changes that were indicative of deception.¹⁹

Dr. William Moulton Marston, an American attorney and psychologist, is credited with inventing an early form of the Lie Detector when, in 1915, he developed the discontinuous systolic blood pressure test which would later become one component of the modern Polygraph. Dr. Marston's technique used a standard blood pressure cuff and a stethoscope to take intermittent systolic blood pressure readings of a suspect during questioning for the purpose of detecting deception.²⁰

¹⁷ *Id.*

¹⁸ *Ibid.*

¹⁹ *Ibid.*

²⁰ *Ibid.*

In 1921, John A. Larson, a Canadian psychologist employed by the Berkeley Police Department, in California, developed what many consider to be the original Lie Detector when he added the item of respiration rate to that of blood pressure. He named his instrument the Polygraph — a word derived from the Greek language meaning many writings — since it could read several physiological responses at the same time and document these responses on a revolving drum of smoked paper. Using his Polygraph, John A. Larson was the first person to continually and simultaneously measure changes in a subject's pulse rate, blood pressure and respiratory rate during an interrogation. His Polygraph was used extensively, and with much success, in criminal investigations.²¹

In 1925, Leonarde Keeler, who had gained firsthand experience in Polygraph interrogations as a result of working with John A. Larson at the Berkeley Police Department, worked to devise a Polygraph that used inked pens for recording the relative changes in a subject's blood pressure, pulse rate and respiratory patterns, thus eliminating the need for smoking the paper and then preserving it with shellac. In 1926, the Keeler Polygraph came on the market as the new and improved Lie Detector, an enhanced version of John A. Larson's Polygraph.²²

In 1938, Leonarde Keeler further refined the Polygraph when he added a third physiological measuring component for the detection of deception- the psychogalvanometer - a component that measured changes in a subject's galvanic skin resistance during questioning, and in doing so, thus signaling the birth of the Polygraph as we know it today.²³

In 1939, Leonarde Keeler patented what is now understood as the prototype of the modern Polygraph -the Keeler Polygraph. Today, Leonarde Keeler is known as the father of Polygraph.

In 1947, John E. Reid, a lawyer from Chicago, Illinois, developed the Control Question Technique (CQT), a Polygraph technique that incorporated control questions (comparison) which were designed to be emotionally arousing for non-deceptive subjects and less emotionally arousing for deceptive subjects than the relevant questions previously used. The Control Question Technique (CQT) replaced the

²¹ *Id.*

²² *Ibid.*

²³ *Ibid.*

Relevant/Irrelevant Question Technique (RIT) which used relevant or irrelevant questions during a Polygraph examination. The Reid Control Question Technique was a major breakthrough in Polygraph methodology.²⁴

In 1948, Leonarde Keeler founded the world's first Polygraph school, the Keeler Polygraph Institute in Chicago, Illinois. In 1958, Cleve Backster, an ex-Polygraph examiner with the CIA, introduced a quantification system of chart analysis, thus making it more objective and reliable. This system for the numerical evaluation of the physiological data collected from the Polygraph charts has been adopted as standard procedure in the Polygraph field today.²⁵

In 1960, Cleve Backster, building upon the Reid Control Question Technique, developed the Backster Zone Comparison Technique (ZCT), a Polygraph technique which primarily involved an alteration of the Reid question sequencing.

Cleve Backster also introduced a quantification system of chart analysis, thus making it more objective and scientific than before. This system for the numerical evaluation of the physiological data collected from the Polygraph charts has been adopted as standard procedure in the Polygraph field today.²⁶

Since 1962, the study of the use of computers in the physiological detection of deception has progressed through several phases.

In the late 1970s, Dr. Joseph F. Kubis, of Fordham University in New York City, was the first researcher to use potential computer applications for the purpose of Polygraph chart analysis.²⁷

During the 1980s, research was conducted on computerized Polygraph at the University of Utah by Drs. John C. Kircher and David C. Raskin and, in 1988; they developed the Computer Assisted Polygraph System (CAPS), which incorporated the first algorithm to be used for evaluating physiological data collected for diagnostic purposes.

In 1992, the Polygraph made its official entrance into the computer age. In 1993, statisticians Dr. Dale E. Olsen and John C. Harris at Johns Hopkins University, Applied Physics Laboratory, in Maryland, completed a software program called

²⁴ *Ibid.*

²⁵ *Id.*

²⁶ *Ibid.*

²⁷ *Ibid.*

PolyScore, which used a sophisticated mathematical algorithm to analyze the Polygraph data and to estimate a probability or degree of deception or truthfulness in a subject.²⁸

PolyScore 3.0 Polygraph Software was developed by analyzing the data from Polygraph examinations administered in 624 real criminal cases in which 303 suspects were non-deceptive and 321 suspects were deceptive.²⁹

In 2003, PolyScore 5.1 Polygraph Software was developed by analyzing the data from Polygraph examinations administered in 1,411 real criminal cases provided by the United States Department of Defense Polygraph Institute for study and comparison purposes.

Poly Score is a computerized Polygraph chart scoring algorithm that uses statistical probability to arrive at truthfulness or deception. It has been shown that validated algorithms have exceeded 98 per cent in their accuracy to quantify, analyze and evaluate the physiological data collected from Polygraph examinations administered in real criminal cases.

In 2003, the U.S. Department of Energy commissioned a review committee of The National Academy of Sciences to study the scientific evidence on the Polygraph. In this endeavour, the committee sifted through existing evidence in the Polygraph research literature and did not conduct any new laboratory or field research on Polygraph testing for, as they clearly reported, real-world conditions are difficult — if not impossible — to replicate in a mock-crime setting or a laboratory environment for the purpose of assessing Polygraph effectiveness.³⁰

The review committee of The National Academy of Sciences concluded that, although there may be alternative techniques to Polygraph testing, none can outperform the Polygraph, nor do any of these yet show promise of supplanting the Polygraph in the near future.

Withstanding more than a century of research, development and widespread use, the Polygraph test remains the most effective means of verifying the truth and detecting deception.³¹

28 *Ibid.*

29 *Ibid.*

30 *Id.*

31 *Ibid.*

6.4 Timeline History of Polygraph test

In the medieval England, practices like putting a suspect under water or throwing him in the fire were prevalent for lie detection .In 1215, these practices were banned by the law “Edict of the Latern Council”.

During 1600, it became a trend to detect lies by the scientific and logical reasoning and by questioning.

In 1730, Daniel DeFoe was the first person who departs from the theory that “the body’s agony would oblige the lying mind to croak out its secrets” and he suggested the evaluation of heart rate to detect deception.

During 19th century, it was believed that truthfulness and lying relate to morality of persons and this is embedded in the personality of the individual.

In 1804, John Isaac Hawkins first coined the term “Polygraph for his copying machine.

In 1895, Cesare Lombroso, “The Father of Modern Criminology” was the first to attempt to use science to detect deception called “Lombroso’s Glove”, a Hydrosygmograph.

In 1897, B. Sticker developed a method for recording galvanic responses using interrogation.

In 1908, James Mackenzie invented ‘ink Polygraph’ which monitored cardiovascular responses by taking the pulse and blood pressure.

In 1915, an American psychologist William M. Marson used sphygmomanometer for a lie detection test.

In 1921, Dr. John A. Larson, an American psychiatrist, developed an instrument which could be called the earliest version of Polygraph. For the first time he prepared permanent record of blood pressure.

In 1926, Leonardo Keelar improved Larson’s Polygraph by adding to it “galvanic skin response” and gave birth to improved version named “Keelar Polygraph”.

In 1932, A.L. Luria gave the opinion that “when a criminal tries to conceal his guilt he becomes more and more tense and does not remain passive during interrogation.

In 1944, Bell laboratory invented sound spectrograph.

In 1953, Wicker, a Professor of the College of Law, University of Tennessee, wrote that if and when convincing evidence obtained by scientific method are produced to expose falsehoods either in court of law or outside then it should be taken in account.

In 1959, American Polygraph association gave its report and issued guidelines for Polygraph tests.

In 1960, a scientist Lawrence Kersta, while working with spectrograph, claimed that through voice prints individuals can be identified.

In 1963, the United States Supreme Court held that “serum induces confession was unconstitutional and it was tortuous practice”

In 1963, when leaks about confidential matters were reported there was proposal at Government to use Lie Detector to discover the source of such unauthorized disclosures.

In 1964, Justice Radger A. Ptaff of Supreme Court of Los Angles observed that “An adequate Polygraph in the hands of competent examiner can be an adequate aid in the administration of justice”.

In 1965, the House Committee on Government operation concluded that “there was no scientific evidence to support the theory of Polygraph and its results were inaccurate”.

In 1970, Badroski stated, “The present legal attitude with respect to the Lie Detector reflects a position which has not been materially recast since, 1923”.

In 1971, the Psychological Stress Evaluator (PSE) or voice stress analyzer (VSA) was developed as an alternative to traditional Polygraph.

In 1973, Florida Court also admitted Polygraph evidence.

In 1974, it was found that “use of Polygraph in various agencies of Federal Government decreased substantially”.

In 1974, the House Committee on Government Operation concluded that the “Polygraph has demonstrated little validity and reliability in the detecting deception other than in laboratory situation”.

Since 197, in India, more than 300 Polygraph tests have been conducted at Forensic Science Laboratory (FSL), New Delhi.

In 1980, the computerized voice analyzer (CVSA) was first used by U.S. Soldier to determine whether Vietnamese prisoners were Vietcong guerrillas or civilians.

In 1980, the word “voice print” was trademark and established the International Association of Voice identification which was merged with International Association for identification.

In 1981, Raskin stated “admissibility of Polygraph evidence appears to be in a state flux”.

In 1983, a highly respected research agency of U.S.A., I.E., OFFICE OF THE Technology Assessment (OTA), published its report about scientific validity of Polygraph.

In 1988, on the basis of various studies the U.S. Congress passed a specific legislation ‘Employees Polygraph protection Act ,1988’ for prohibition use of Polygraph in private market job.³²

6.5 Procedure for conducting Polygraph Test

Originally, it is significant to note that there is no one polygraph technique. There are a great many polygraph techniques known by many names, even though they all have certain qualities in general. All polygraph tests involve the measurement of physiological responses (usually, respiration, palmar sweating, and cardiovascular activity) with an instrument while the subject is asked a series of questions. Polygraph tests begin with an interview during which the examiner psychologically prepares the subject for the test. Once collected, the physiological data are usually evaluated by the examiner. Failed law enforcement examinations are often followed by an intense interrogation designed to force the subject to confess to the crime in question. However, substantial differences exist between the various polygraph tests in the

32 Satyendra K. Kaul and Mohd. H. Zaidi, *Narco-Analysis, Brain Mapping, Hypnosis and Lie Detector Test, In Interrogation of suspect* 567-69 (Alia Law Agency, Allahabad, 2008).

character of the pretest interview, in the structure of the question series, and in the assessment of the physiological data.³³

Polygraph test is conducted is commonly known as 'Lie Detector' test. When a person is truthful, he has no tension in his mind. In this stage no psychological change arises, but when a person lies, psychological changes arise.³⁴ In this test examination conducted by the probe attached to the body of the person, who is interrogated by the expert.³⁵ The variation in the pulse rate, the heart rate, the skin conductance, the blood pressure etc are measured .Before conducting, the Polygraph test, there are some steps which are to be followed by the examiner –

- Go through the background of the case.
- Formatting questionnaire based on the background of the case.
- Apprise the subject on the objective of the test,

the nature of the instrument, its various attachment and recording.³⁶ During the test the heart beat increase; blood pressure goes up, breathing and so on and so forth. In the very beginning a baseline for the psychological characteristic is established by asking whose answer the investigator known. Deviation from this pre determined base line for truthfulness, measure by the Lie Detector, is taken as a sign of life .This test does not involve any direct invasion of the body .This basically produces a graph of multiple psychological parameters and hence the name Polygraph .In this test, the Polygraph taken gives a reading of the deviation of the psychological parameter from the base line for truthfulness, which is determined by the natural question asked it the very beginning. The graph that it produced after the interrogation with target question, aimed to make a possible liar uneasy in his psychological reaction is examined by an expert who would then explain their reaction, in the court and also to the law enforcement officer to aid them in their investigation. His conclusion, which would flow from his reading of the Polygraph, may be admitted or rejected by a judge on appreciation of the statements and the objection raised thereto by the defense and other expert .In case of a Polygraph, the subject may or may not answer the question, his psychological reaction and the response of his answer to the analysis of that is

33 Charles R. Honts and Mary V. Perry, "Polygraph Admissibility: Changes and Challenges"16 Law and Human Behavior358 (1992).

34 Joe Niehaus, *Investigative Forensic Hypnosis*140 (CRC Press, London, 1999).

35 "Constitutional validity of an evidentiary validity of scientific test"49:4 Journal of Indian Law Institute 529 (2007).

36 "In Focus Lie Detector" LawZ10 (2010).

sought to be tendered as evidence if and when the occasion arises.³⁷ During the Polygraph test an expert and skilled examiner will make assessment of the following procedure –

- a) An assessment of examiner's emotional state;
- b) Medical fitness of the examinee;
- c) To identify overly responsive behaviour specialised tests be conducted;
- d) To asses overly responsive behaviour specialised test be conducted ;
- e) To do factual analysis of case information and
- f) To do pre-test interview and detail review of question.³⁸

In Polygraph process three aspects of human physiology are tested i.e.

- a) Pneumograph tracing
- b) Electro dermal activity tracing, and
- c) Cardio vascular tracing.

The first relate to respiration, the second to skin conductor or skin resistance and the third with blood volume and pulse rate.³⁹

When an individual undertakes a Polygraphic lie detection test, the first phase of this usually involves an interview with the Polygrapher during which some biographical question will be asked or job application the actual nature of the question which will be asked during the lie detection test. It will be asked by the Polygrapher to the individual whether the individual understand every question .Many Polygraphers also use this first phase to obtain an initial impression of the testee and to judge whether the individual seems to be more of an honest, upright citizen than a deceiver. At this time, the Polygrapher will not have been switched on, but now the Polygrapher will explain its basic principle .He or she will connect the individual to the machine and show the testee how it work.⁴⁰ The second phase begins when the suspect is asked a series of question to which the reply of either 'no or 'yes' must be given. The Polygraph is switched on and now is out of sight of testee, usually behind him or her. During this phase, the various psychologically activity which may accompany the testee's answer to the question is displayed and recorded on pen chart

³⁷ *Supra* 6, 550.

³⁸ *Supra* 32, 594.

³⁹ *Ibid.* 594.

⁴⁰ Antony gale (ed.), *The Polygraph test, Lies truth and Science* 12(Sage Publication, London, Delhi New, edn.1988).

by the Polygraph.⁴¹ The basic principle underlying modern Polygraph is that of making a comparison between how a person respond to non-incriminating question and how he or she respond to incriminating question. This comparison does not look for any complex pattern of responding (for example, high heart rate and also low respiration rate when lying, and the reverse when telling the truth, but at magnitude and frequency of psychological activity to various sort of question.⁴²

In relevant questioning techniques ,several irrelevant questions are framed which have no basing on the case or involvement of the subject in a crime under investigation .The relevant question are interposed in-between irrelevant question ,which have a direct bearing on the case ,and are likely to draw stressed response from a quality subject.⁴³ The typical relevant irrelevant test employ a series of 10-15 question comprised of crime relevant questions (e.g., “did you rob Mr. H.C. Gupta”) and irrelevant (neutral) question (e.g., “Are you sitting down”). The rational of the RT predicts that the since a guilty subject will answer the relevant question deceptively, it is expected that the guilty person will exhibit relatively strong physiological reaction to the relevant as compared to the truthfully answered irrelevant question. Conversely, the rational of the RTI predicts that since an innocent subject will answer all questions truthfully, it is expected that there will be little difference in the strength of reaction to the two types of questions.⁴⁴

6.5.1 The Control Question Test (CQT)

Now a days, the control question (CQ) technique is the most commonly used for Polygraph test. Control question tests are the second group of detection of deception tests. Control question tests are the most commonly used polygraph test in law enforcement today.⁴⁵ This test consists of control question and relevant question. Control question are interposed among the relevant and irrelevant question. The control questions are irrelevant to the facts being investigated but they are intended to provoke distinct psychological responses, as well as false denials.⁴⁶ They do not directly relate to the crime under investigation, but to a similar situation in which his

⁴¹ *Ibid.*

⁴² *Id.*13.

⁴³ *Supra* 7, 11.

⁴⁴ Murray Kleiner, Handbook of Polygraph testing 3(Academic Press, New York,2002)

⁴⁵ *Supra* 13, 360.

⁴⁶ Dr. Subhodh K. Singh ,”Admissibility of Polygraph test in Indian Administration of Criminal Justice System” CriLJ 77,(2012).

answer may have a feeling of concern with respect to either its truthfulness or its accuracy.⁴⁷ These responses are compared with the responses triggered by the relevant question. Hypothetically, a truthful subject will show greater psychological responses to the control question which he has reluctantly answered falsely, than to the relevant question, which the subject can easily answer truthfully. On the other hand, a deceptive subject will show greater psychological responses while given false answer to relevant question in comparison to the responses triggered by false answer to control questions. In other words, a guilty subject is more likely to be concerned with lying about the relevant facts as opposed to lying about other facts in general. An innocent subject will have no trouble in truthfully answering the relevant question but will have trouble in giving false answer to control questions.⁴⁸

6.5.2 A Direct Lie Test (DLT) or “stim test”

When a subject is telling the truth, this test tries to detect lying by telling the subject to deliberately lie. The psychological responses are being compared.

6.5.3 The Guilty Knowledge Test (GKT)

This test compares the psychological responses to multi-choice type questions relating to crime under investigation, one choice of which contain information relating only to the crime investigation (and sometimes not) and the real culprit would know about.

6.5.4 Peak of Tension Test (POT)

Peak of tension question is framed when some of the important details of the offence in question are not made known to the subject. The test question are framed in such a way that only one question will have bearing upon the matter under investigation and all others come close to the guilty knowledge. The series of question framed are administered with the instrument attached. During the first reading if the subject has no knowledge or information on the pertinent question put to him then there would be no tension.⁴⁹ The honesty behind Polygraph test is that when a subject is lying in response to a question, he/she will produce psychologist responses that are

⁴⁷ *Supra* 8, 13.

⁴⁸ *Supra* 12, 77.

⁴⁹ *Supra* 2, 108.

different from those that arise in the normal course. The procedure of the examination can be listed own as under-

- Several instruments like Cardiograph, Pneumograph, cardio cuffs, and sensitive electrodes are attached to the subject to measure his psychological responses.
- Then the examiners analyse and examine their results to gauge the credibility of the subject's answer.
- Instrument such as cardiograph, Pneumograph, cardio cuffs, sensitive electrodes are used in the course of the Polygraph examination.
- The measure change in aspect such as respiration, blood pressure, blood flow, pulse and galvanic skin resistance.

The truthfulness or falsity of the subject is assessed by relying on the record of the psychological response. It is seen that on many times the suspect and defendants in criminal cases have sought reliance to this technique to demonstrate their innocence.⁵⁰ It can be said that the theory behind the application of this technique is based on the fact that a guilty person may possess such knowledge which cannot be possessed by any other person who is innocent .The pertinent question would bring in emotional reactions in a guilty person alone in comparison to an innocent person.⁵¹

Further it can be said that a person on whom this test is to be conducted is to sit on the Polygraph chair so that the person may face the instrument and the experts may ask the question from the accused in an easy way.

6.6 Recent advances in the Detection of Deception

The idea that the detection of deception is merely a kind of psychometric instrument, or a psycho physiological technique, must be considerably revised to take into account the social nature of both deception and its detection. The investigation of the social and other factors in deception has become a fundamental area of inquiry in psychology.⁵²

In 1895, Lombroso, who is known as the founding father of Criminology, was the first to experiment with a machine measuring blood pressure and pulse rate to

⁵⁰ *Id.*,108.

⁵¹ Yawer Qazalbash, *Law of Lie Detectors*, 67 (Universal Publication ,Allahabad,2011).

⁵² "The Physiological Detection of Deception: The accuracy of polygraph testing can be affected by such variables as attentiveness, drugs, personality, and the interaction between examiner and subject", *available at*: www.jsyore.org/stable/27851548 (visited on 04-12-2014).

record the honesty of criminals. He called it a hydroshygmograph. A similar device was used by Harvard psychologist William Marston during World War I in espionage cases, who brought the technique into the American court systems. In 1921, John Larson added the item of respiration rate, and by 1939, Leonard Keeler, one of the founding fathers of forensic science, added skin conductance and an amplifier, therefore signaling the birth of the Polygraph as we know it today. Polygraph (Lie-Detector) is based on the theory of emotional links of a person i.e. psychologically a change in a person's consciously held emotion produces a protection response in the form of physiological changes in his blood pressure, pulse rate, respiration and electro-dermal response(GSR).⁵³

The main innovation in the traditional Polygraph has been the introduction of computer to trace and examine the physiological reply and data, through some innovations in the input devices to increase the number of recording, to decrease the discomfort and reduce the time for examination have also come up. Computerized Polygraphs have the following advantages:

- Operational training needs less time
- Provide better interpretable data
- No frequent calibrations as in traditional Polygraphs due to pen distortion.

Moreover the successful operation of Polygraph depends on the experience, personality, integrity of the examiner, proper operational environment, and the interrogation room.⁵⁴

6.7 Scientific validity of Polygraph Test:

Advancement in science and technology are unlikely to leave our untouched, and the Polygraph is no exception. The Polygraph is a scientific instrument which is used for research into bodily responses and their relationship with psychological process. As an instrument, it is reliable in producing a record of bodily event.⁵⁵ The Validity of Polygraph testing means, its ratio of accuracy regarding the detection of deception and truthfulness. Polygraph test take a number of forms and its validity can

⁵³ M.K.Sahu, "Admissibility of Scientific Evidence and the Bias against Lie Detection" available at: www.google.com (visited on date 21-17-2013).

⁵⁴ *Ibid.*

⁵⁵ Antony Gale (ed.), *The Polygraph Test, Lies Truth and Science* 8(Sage Publication, London,1988)

be measured in a number of ways.⁵⁶ The validity of Polygraph test is based on the assumption that the test consistently measures the same properties. This consistency is its reliability and it is the degree to which the test can be repeated. If on repetition the same result is obtained then it is reliable. It also means that if the examiner on analysis of the chart comes to a conclusion, the same conclusion on the basis of same chart analysis should be drawn by another examiner. It means that the test should be reviewable. Polygraph test is basically meant for lie detection; therefore, it is necessary that the test should adequately measure the underlying trait it designs to assess. It is called “construct validity”. Construct validity is essential from theoretical point of view but from practical point of view “criterion validity” is necessary for validity analysis. “Criterion validity” means the relationship between test results with the ground truth. However, it is very difficult to generalize a data of validity criterion. It is not clear which part gives accurate result and which part does not give. Validity criterion is used in considering evidence about usefulness of test.⁵⁷ At present there are different Polygraph tests based on different theories. This makes it difficult to establish construct validity.⁵⁸ At the present time the significance of Polygraph test is increasing with passing of the time. Because by the help of this technique it is possible to detect the truth. The test is being conducted without any use of third degree method. In this technique the question is put up to the accused person and the accused person gives answer of the question only in yes or no. A Polygraph of the person subjected to test is taken and the experts analyse the Polygraph and gives their opinion in the court. Now the court has to decide about the admissibility of the said test result.⁵⁹

6.8 Constitutional validity of Polygraph test: Judicial Response

The lie Detection division renders valuable Polygraph aids in a number of important investigations conducted by CBI, Judiciary, Delhi Police and other law enforcement agencies. The Lie detection division maintain latest version of the computerized Polygraph equipment's. The objectives of Lie detection are:⁶⁰

56 Deepak Ratan and Mohd. H. Zaidi, *Forensic Science in India and the World* 493 (Alia Law Agency, Allahabad, 2008).

57 *Id.*, 494.

58 *Ibid.*

59 *Supra* 6,580.

60 Dr. Gupta and Agrawal, *Forensic Science in Criminal Investigation* 146 (Premier Publishing Company, Allahabad, 2013).

- To verify the statements of suspects, witnesses and the complaints.
- To economise and accelerate the process of investigation by screening innocent person where a large number of suspects are involved.
- Scientific interrogation of suspects in white collar crimes.
- To corroborate the findings of investigation by investigating officers.⁶¹

The main legal provisions which governs the expert evidence (Lie Detector test), are in Indian Constitution, Code of Criminal Procedure, Indian Evidence Act. In Indian Constitution there are various provisions which are related with the protection of the accused person. In the Constitution of India, the provision of life, liberty and freedom has been given under Article 20 and 21. According to Article 20(3) "no person accused of any offence shall be compelled to be a witness against himself". This article applies only to an accused and only speaks of self-incrimination evidence by way of compulsion. Under this Article only an accused person can avail the protection if he is compelled to be a witness against himself.⁶² Every civilized society guarantees the right against self-incrimination as a fundamental of fair trial in a criminal offence. According to this principle, a person accused of a criminal offence cannot be forced to incriminate himself or yield evidence against himself. The right against self-incrimination is basically designed to prevent the use of law or the legal process to force from the lips of the accused the evidence necessary to convict him. Despite the fact that the right as been defined broadly, its scope as been confined by the judicial interpretations evidence that is testimonial in nature. In other words, it has been held that the protection is available only to the evidence which require a volitional act on the part of the accused person thus rendering it testimonial or communicative in nature and it will not protect taking of blood sample, fingerprint etc. from the accused. The protection would be available only from the time the person is charged with an offence it does not extend to the pre-accusation or investigation stage if a strict interpretation of Article 20(3) is done. The immunity will not be available to a person against whom no accusation has been made when a compulsory process or notice is issued directing him under pain or penalty to produce a document though ultimately it may incriminate him for the commission of an

⁶¹ *Ibid.*

⁶² *Supra* 35, 532.

offence.⁶³ The Constitutional embodiment invigorating the ban on self-incriminating has been enshrined in Article 20(3) of the Constitution of India.⁶⁴ Article 20(3) provides the protection to the accused person in respect of the conviction. In case of *Sidhartha Vashist v. State*⁶⁵ it was held by the court that the interrelationship between the 'right against self-incrimination and the 'right to fair trial' has been recognised in most jurisdictions as well as international human rights instruments. The guarantee of 'presumption of innocence' bears a direct link to 'right against self-incrimination' since compelling the accused person to give evidence would place the burden of proving innocence on the accused instead of requiring the prosecution to prove guilt. Thus the right to refusal to answer such questions that may incriminate a person is a procedural safeguard which has gradually evolved in common law and bears a close relation to right to fair trial. When the question arise that when a person can may claim the protection against self-incrimination under Article 20(3) of the Indian Constitution. In the case of *State of Bombay v. Kathi kalu Oghad*⁶⁶, the Hon'ble Supreme Court observed that conducting the Polygraph by the police without the consent of accused person is clear violation of article 20(3) of the Indian Constitution. The right against forced self-incrimination is enshrined in Article 20(3) of the Indian Constitution as well as in the Criminal Procedure Code. In this case the Bombay High Court had to decide whether compelling the accused person to undergo this test would violate his right to silence and compel him to provide evidence against himself. In this case Palshikar j. held that the right against self-incrimination applies only to court proceeding and not to police interrogation.

In case of *M.P. Sharma v. Satish Chandra*⁶⁷, the Supreme Court has measured the principle underlying Article 20 (3) of the Indian Constitution, which says that no person accused of any offence shall be compelled to be a witness against himself. In this case it was contented before the court that that guarantee under Article 20(3) of the Constitution against testimonial compulsion is confined only to oral evidence of a person standing his trial for an offence when he is called to the witness stand. The Supreme Court has said by rejecting this contention that there is no reason to confine the content of the Constitution guarantee to its barely literal import, and

63 A search warrant leading to discovery of contraband is a perfect example.

64 *Supra* 20,533.

65 AIR 2010 SC 2352.

66 AIR 1961 SC 1808.

67 AIR 1954 SC 300.

therefore, to limit it would be to rob the guarantee of its substantial purpose and to miss the substance for the sound. After saying this, the Supreme Court has made the following observation:

“To be a witness is nothing more than to furnish evidence and such evidence can be furnished through the lips or by production of a thing or of a document or in other modes”.

These observation clear shows that a person can be a witness and can provide evidence against himself by different varieties of modes. One method would be to appear for medical examination and, thus, to enable the prosecution to some evidence against him.

In *Ram Jawayya Kupar's case*⁶⁸ it was held by the court that in the absence of any law, any infringement in fundamental right must be struck down as unconstitutional. Lie detection test comes under the general power of investigation (section 160-167, Cr.P.C) But it must be realized that it is a choice of the person to allow himself/herself to be put to Polygraph test or not and it should not be left to the discretion of police. Except it is allowed by the law it must be seen as illegal and unconstitutional. But if this test is conducted by the investigating authority, it must be conducted with the free consent of the person. Free consent means that it is chosen one and is not given under coercive circumstances for example if a person says that “I wish to take a Lie Detector test because i wish to clear my name” it shows that he wants to undergo Polygraph test but it is still to be shown that whether this voluntariness under coercive circumstances or not. If a police officer told to a person “take a Lie Detector test and we will let you go”, it shows that the police officer has linked up the freedom to go with the Lie Detector test and as such it cannot be held voluntary. These kinds of statement are held to be self-incriminatory.

If a person has committed a heinous crime and he is lying or his act is against the security of Country, such person cannot take the benefit of right against the self-incrimination under the Article 20(3) of the Indian Constitution. It means that under such circumstances, this test may be conducted by the investigating agency to find out the truth. In case of *Nandini Sathpathi v P.L. Dani*⁶⁹, the former Chief Minister of Orissa, has made complaint that she was being prosecuted for her refusal to answer

68 1955 (2) SCR 225.

69 AIR 1978 SC 1025.

police question about a corruption case lodged against her. She said that she cannot compelled to give answer of the question asked by the police officer as she has right against self-incrimination under Article 20(3) of Indian Constitution and she has also been protected under section 161(2) of Cr.P.C. In such circumstances it depend upon the nature corruption .if the lady has committed simple mistake or not a heavy corruption then its ok otherwise she may compel to undergo the Lie Detector test. There must be Article 20(3) but there is loss in using Lie Detector test depending upon the gravity of facts of the cases.

In *Ramchandra Reddy v. State of Maharashtra*⁷⁰, it was held by the court that “The Lie Detector test is an examination which is conducted by various probe attached to the body of the person who is interrogated by the Expert. In this test the heart rate, the skin conductance is measured. The underlying theory of this test is that when people lie they become nervous. The heart beat increases, blood pressure goes up, breathing rhythm changes, perspiration increases, etc. A baseline for this physiological characteristic is established by asking the subject questions whose answers investigators know. Deviation from the baseline for truthfulness is taken as a sign of lie. Consequently, there is no direct incursion of the body. In this test the Polygraph is taken which gives this reaction and an expert would then explain these reactions in the Court which would be his reading of the Polygraph from which would flow this conclusion which are to be admitted or not admitted by a judge on appreciation of the statement and the objections raised thereto. In this case, the witness may answer or may not answer the questions. The response of his answers to questions as recorded on the Polygraph analysis of which is required to be tendered as evidence if and when the occasion arises.”

In *D.K. Basu v. State of West Bengal*⁷¹, the Honn’ble Supreme Court has emphasized on the importance of the preventing the cruel, inhuman, degrading treatment while a person is taken into custody. In the present context involuntary and forceful administration of any of the three scientific techniques like Narco-Analysis test, Polygraph test and Brain Mapping in a forensic laboratory or in a hospital, physically confining the subject will fulfill the requirement of custodial environment and thus will attract the provision under Article 20(3) and Article 21 of the

70 2005 (1) CCR 335 (DB).

71 AIR 1997 SC 610.

Constitution. This is applicable not only for the accused, suspect or witness but also for the investigation authorities who questioned in the process of investigation without being brought in the record as witness. It is clear that each of the three scientific techniques causes the subject to lose his control over his responses. It is clear from the language of the Article 20(3) and Article 21 of the Constitution that the involuntary administration of the above three scientific techniques will amount to cruel, inhuman and degrading treatment in the context of Article 21.⁷²

In the case of *Jitubhai Patel v. State of Gujarat*⁷³, since the state had filed affidavit that it shall not conduct the test on the accused person without his consent, the issue of admissibility of scientific evidence becomes academic only. It may be decided at some different occasion. In this case it was held that the scientific tests such as Polygraph test, Narco-Analysis test can be conducted without taking the consent of the accused person. It should be kept in the mind that there has been a great scientific advance and there is subtle difference between old test methods of blood testing or fingerprinting and the modern era's Polygraph and Narco-analysis test. Old tests were of the nature of physical tests, but the new scientific tests are something more than physical tests. A general opinion is being formed that these tests should be applied not only to ordinary criminal but even to VVIPs. If these scientific methods are not encouraged then use of third degree methods would be encouraged tests.

The principle of protection from self-incriminating evidence is founded on the presumption of innocence; the maxim "*Nemo tenetur seipsum prodere*" which means no one is bound to be accused against himself.⁷⁴ As far as the Indian law regarding this is concerned, the protection against self-incrimination continues to be more or less same as in the English common law.⁷⁵ The protection has been given to the accused person from self-incrimination in Article 20(3) of the Indian Constitution and section 161(2) of Code of Criminal Procedure. It has been given under Article 20(3) and Section 161(2) code of criminal procedure that, "No person accused of an offence shall be compelled to be a witness against himself" and "Such person shall be bound to answer truly all questions relating to such case put to him by such officer, other than questions the answers to which would have a tendency to expose him to a

⁷² *Supra* 1, 110.

⁷³ 2005 (10) SCC 545.

⁷⁴ *Noormohmed Jamalbhai Latiwala v. State of Gujarat* MANU/GJ/0131/2004.

⁷⁵ *M.P. Sharma and Ors. v. Satish Chandra, District Magistrate, Delhi and Ors.* 1954 SC 154.

criminal charge or to a penalty or forfeiture” respectively. In the Polygraph test no force is used. The underlying principle of the Article is the presumption of innocence of the accused person in every criminal prosecution, where the burden of proving the guilt squarely lies on the prosecution. According to this principle, it is the duty of prosecution to discover facts and produce evidence to prove the guilt before the court. The natural inference would be that extracting information of facts from the accused person through Lie Detector devices would hit the principle of self-incrimination, provided under Article 20(3).

The idea behind the protection against self incrimination is to support a free situation in which the accused can be certain to furnish evidence in courts and be of significant aid in elucidating truth in a case, with reference to material within their awareness and in their possession.⁷⁶ Anything caused, by any kind of threat or inducement by a person directed towards the accused or likely to be accused of any offence, which causes him to act involuntarily and further the case against himself in any prosecution against him or which results or is likely to result in the incrimination of that person qua any offence, is violative of the fundamental right guaranteed under clause (3) of Article 20 of the Constitution of India.⁷⁷ ‘Involuntary’ is defined as an admission, especially by an individual who has been accused of a crime that is not freely offered but rather is precipitated by a threat, fear, torture, or a promise.⁷⁸

The phrase ‘compelled testimony’ is read as evidence procured not merely by physical threats or violence but by psychic torture, atmospheric pressure, environmental coercion, tiring interrogative prolixity, overbearing and intimidatory methods and the like.⁷⁹ The purpose of lie detection is to elicit the truth from the suspects devoid of any physical coercion. Protection against self incrimination is an instrument for the protection of the innocent and not intended for the acquittal of the guilty.⁸⁰

In the famous case of *Selvi v. State of Karnataka*⁸¹, there was a question before the court relating with the relevancy of Polygraph test. In this case the court

⁷⁶ Wigmore on Evidence, Vol. III, page 307.

⁷⁷ *The State of Bombay v. Kathi Kalu Oghad and Ors.* AIR 1961SC 1808.

⁷⁸ *Supra* 44.

⁷⁹ *Nandini Satpathy v. P.L. Dani and Another* AIR 1978 SC 1025.

⁸⁰ Dr. R.E. House, First Annual Meeting of the Eastern Society of Anesthetists 1925, Herzog A.W. Medical Jurisprudence Indianapolis.

⁸¹ AIR 2010 SC 1974.

has to decide that whether conducting the Polygraph test on the subject without his/her consent is constitutionally valid or not. The Hon'ble Court observed that Article 20(3) protects an individual's choice between speaking and remaining silent, irrespective of whether the subsequent testimony proves to be inculpatory or exculpatory. The main object of Article 20(3) is to prevent the forcible 'conveyance of personal knowledge that is relevant to the facts in issue'. The result obtained from each of the impugned test bear a 'testimonial' character and they cannot be categorized as material evidence. In this case, the Supreme Court has laid down some guidelines regarding Polygraph test also. The Court further held that Polygraph test should not be conducted on the accused person without taking his/her consent. If such test is conducted without taking the consent of the accused person, it would be a clear violation of Article 20(3) of Indian Constitution.

In *Rojo George v. Deputy Superintendent of Police*⁸², CBI compelled the suspect to undergo the Polygraph test and Narco-Analysis test for revealing the truth. The suspect raised the plea that the proposed Narco-analysis test is extremely problematic test which was conducted after administering sodium pentathol due to which the central nervous system affects the heart rate slow and blood pressure became low. It was further stated that it is very difficult to determine the correct dosage of the drug to be administered on a subject since the same varies according to the age, sex, physical constitution and also mental attitude and will power. It was further stated that a wrong dose could send a subject into coma or even cause death. Further the petitioner apprehended that if he was subjected to Narco-analysis at this young age of 24, it would have far reaching consequences on both his physical and mental constitution. It was averred that he CBI attempt is to fasten the criminal's liability in the above crime to someone. It was stated that the petitioner whole heartedly co-operated with the investigating authority while conducting the Narco-Analysis test as well as Polygraph test but the investigating authority was not able to collect any material. According the petitioner, investigating authority is bound to follow the procedure established by law even in the case of a suspect. He may not be compelled to undergo the test without an undertaking from the investigating authority that no adverse consequences would result by undergoing that test It was also stated that subjecting a person into Narco-analysis would amount to violation of the

82 2006(2) KLT 197.

fundamental right guaranteed to the petitioner under Article 20(3) of the Constitution of India. 'Narco-Analysis' is a scientific test conducted by the expert on the subject after taking all possible precaution. It is true that it has got adverse reaction also. But such adverse reaction can happen while administering any medicine prescribed by doctors practicing modern medicine. So merely because there is a remote possibility of adverse reaction, use of such techniques in conducting investigation cannot be prevented. It was argued that recording of a statement of a person undergoing Narco-Analysis would amount to testimonial compulsion and the same is violative of Article 20(3) of the Constitution of India. The protection against compulsion to be a witness is limited to person accused of an offence. There is no Constitutional protection to persons other than the accused. The immunity under Article 20(3) does not extend to compulsory exhibition of the body or giving blood specimen. It is a considered view that the same principle should apply to Narco-analysis test also because it is also a scientific test conducted by a team of expert and not will amount to custodial interrogation by police. In present days, the techniques used by the criminals for commission of crime are very sophisticated and modern. The conventional method of questioning may not yield any proper result at all. That is why the scientific tests like Polygraph, Narco-Analysis Brain mapping test etc are now used in the investigation of a case. When such tests are conducted under strict supervision of the expert, it cannot be said that there is any violation of the fundamental right guaranteed to a citizen of India.

In Criminal Justice System, forensic science occupies a very significant place and it is admissible in the courts .Section 53(1) of Cr.P.C.(Criminal Procedure Code) provides for the medical examination of the accused by the medical practitioner at the request of the police officer .According to Sec 53(1) of Criminal Procedure Code – “when a person is arrest on a charge of committing an offence under such circumstances that there are reasonable grounds for believing that an examination of the person will afford ,evidence as to the commission of an offence ,it shall be lawful for a registered medical practitioner ,acting at the request of the police officer snot below the rank of sub-inspector ,and for any person acting in good faith in his aid and under his direction ,to make such an examination of the person arrested as is reasonable necessary in order to ascertain of the facts which

may afford such evidence ,to use such force as is reasonably necessary for that purpose”.

Through this Section, the forensic science gets an entry into the field of criminal investigation .The Amendment of 2005 made to Sec 53 of Cr.P.C. positive and protective towards the recognition of the important of scientific test which include Narco-Analysis, Brain mapping apart from others.⁸³

By virtue of sec 161(2) of Cr.P.C. ,the legislation has protected the citizen’s rights against self-incrimination .According to Sec 161(2) –“every person is bound to answer truthfully all question ,put to him by a police officer ,other than the question the answer to which ,would have a tendency to expose that person to a criminal charge ,penalty or forfeiture.” The right to silence has been granted to the accused and no one can forcibly extract statements from the accused who has the right to keep silent during the course of investigation.

Section 39 Cr.P.C. also casts an onerous duty upon any person to give relevant information to the police .This Section as well as other sections relating to information to investigators has not been held unconstitutional. For an effective and efficient investigation, such a power to investigator appears to be necessary for bringing criminals to justice.

It can be easily inferred from the bare reading of the aforesaid Section along with explanation that the term ‘examination ‘used in the explanation is very wide to include modern scientific techniques of investigation including DNA Profiling, Narco-Analysis test and Polygraph test.

6.9 Evidentiary Value of Polygraph Test

Section 3 of the Indian Evidence Act defines evidence as “Evidence” means and includes

- (1) All statements which the court permits or requires to be made before it by witnesses, in relation matter of fact under inquiry ;
- (2) All documents including electronic records produced for the inspection of the court;

⁸³ Gunjan Agrahari “Narco-Analysis P300 Test: its object and evidentiary evaluation” 3 CriLJ72 (2007).

Such documents are called documentary evidence.⁸⁴

According to above mentioned definition of 'Evidence', answers recorded during Narcoanalysis or Polygraph tests cannot permit them to be admitted as they do not fulfill required conditions, Factors and provisions of law. The Court may, according to the given definition 'permit' a statement which at the most may be called as evidence but that would not render it to become admissible automatically. The court may either admit the permitted statement or reject it on definite consideration, principles and rules of law, as its admissibility depends on number of factor.⁸⁵

The statement recorded of the person put under Lie Detector test hit the principle and rule of voluntariness, because they are either recorded in the state of semi-consciousness or the informations are extracted through so called scientific equipments and methodologies which scientists themselves question for reliability. Cardinal rule of evidence and criminal jurisprudence as well, is that the person making the statement must be in a fit state of mind.⁸⁶

"In general sense, 'statement' means an allegation, declaration matter of fact. The term has come to be a used of a variety of formal narratives of facts, required by the law in various jurisdictions as the foundation of judicial or official proceedings and in limited sense is a formal exact, detail presentation."⁸⁷

An oral or written assertion or non verbal conduct is intended by him as assertion. Oral or written verbal assertion or non verbal conduct of person intended by him as a substitute for oral or written verbal expression.⁸⁸ Reports are sent monthly or periodically by a bank to its customer or by a creditor to a debtor, setting forth amount credited and balanced due."⁸⁹

As confession (or the admission) is a statement, therefore the term 'statement' also needs some elaboration. In its primary meaning a 'statement' is "something that is stated", but communication of that stated 'something is not necessary in order that it may constitute a statement.'⁹⁰

⁸⁴ Section 3, Indian evidence Act, 1872.

⁸⁵ Yawer Qazalbash, *Law of Lie Detectors*, 166 (Universal Law Publication, Allahabad, 2011).

⁸⁶ *Id.*, 167.

⁸⁷ Manpreet Singh, "Constitutional validity of Brain Mapping and Narco-Analysis", 1PULJ 304(2008).

⁸⁸ *Ibid.*

⁸⁹ *Ibid.*

⁹⁰ *Supra* 59, 139.

The word statement has also not been defined in the Evidence Act, but from sections 17 to 21, 32, 39, and 145 use the word in different contexts. A simple statement may either be written or oral. A statement may be made to someone for purpose of communication, yet it connotes a wider meaning. The words used in a statute are generally taken to be in the same sense throughout, unless there is something repugnant in the context.⁹¹

Section 24 to 30 of evidence Act deal with and this segment is a part of broader segment comprising from Section 17 to 31 which deal with admission generally. Sections 162 to 164, Cr.P.C. deal with various aspects of confession in different circumstances. Sections 24, 25, 26 of the Indian Evidence Act deals with confession made by the accused person to a police officer in the police custody. A confession of the accused leading to the discovery of fact, while in custody of police (section 27), so much of such information, whether it amounts to confession or not, may be proved.⁹² Section 28 deals with confession made after removal of impression caused by inducement, threat or promise. Such confessions are relevant under this section.

Confession may be divided into two category i.e. judicial confession and extra-judicial confession. Extra judicial confessions are those which are made by a person elsewhere than before a magistrate or a court, meaning thereby that they are made before a private individual, which includes even a judicial officer in his private capacity, or a judicial Magistrate not empowered to record the confession under the section 164, Cr.P.C., or a Magistrate, though empowered, recorded the confession at stage when section 164 does not apply.⁹³

The Supreme Court further observed that an extra-judicial confession must pass a test of reproduction of the exact words, the reason and motive for making the confession, and also the person selected in whom the confidence is reposed.⁹⁴ These observations would naturally exclude the confession recorded through Lie Detector tests. Only one of the condition i.e., reproduction of the exact words may be complied, but the said tests would fail to comply other condition. There are great number of cases which hold that an extra-judicial confession must be received with

⁹¹ *Ibid.*

⁹² *Supra* 65,144.

⁹³ *Id.*, 149.

⁹⁴ *Rahim Beg v. state of Utter Pradesh*, AIR 1973 SC 343.

the greatest care and caution (which would naturally include the viability, drawback and acceptability of Lie Detector tests). In case of *Ram Singh v. Sonia*⁹⁵, it was held by the court that where the court finds that extra-judicial confession is true and voluntary then it may enter into question of sufficiency. It was observed that for judging the confession court must examine the content and then must ascertain whether the facts are corroborated with other evidence, and finally the probability test should be applied. Application of probability test is necessary as the extra-judicial confession, as in nature of things stand, a weak piece of evidence.

The main object of putting a suspect /accused to Polygraph test is to take out or at least to know how far she or he has awareness or information about the crime under enquiry and also to extract acknowledgement of guilt of the person. Some people contend and try to widen the scope of confession to include oral and written statement in reference to Polygraph test etc., which in their view amount to confession. The contention is based on false notion and contradicts clear provision of law.

6.10 The Credibility of an Expert Witness

Another Act which relates to the constitutionally validity of Lie Detector on the subject is Section 45 of Indian evidence act. It is an ancient rule of common law that on a subject requiring special knowledge and competence, evidence is admissible from witnesses who have acquired by study or practice the necessary expertise. This is the most important section of the Act. According to Section 45 'When the court has to form an opinion upon a point of foreign law, or science or art, or as to identity of handwriting (or finger impressions), the opinions upon that point of persons specially skilled in such foreign law, science or art,(or in questions as to the identity of handwriting or finger impressions) are relevant facts.'⁹⁶The persons who conduct such scientific test are called experts.

In India, the evidence of Polygraph expert in order to be adduced in the courts it must be the first proved that the qualified polygraphist is in fact there as required under Section 45 of Indian Evidence Act 1872. It is a basically science, and provides the polygraph expert can show this qualification and experience the evidence of which

⁹⁵ AIR 2007 SC 1218.

⁹⁶ See also Section 293 of the Code of Criminal Procedure deals with reports of certain Government scientific experts.

is relevant. But now the main question is admissibility of such evidence.⁹⁷ In *Ram Singh v. Sonia & others*⁹⁸, the Supreme Court has held that since the polygraph evidence is not a subject coming under expert's evidence as per Section 45 of Evidence Act and it being a science in mystique, it could at best be used as an aid to investigation and not as evidence. Since Polygraph examination cannot be admitted in Court they can only be used for investigation purposes. The investigation officer may see the polygraph test to help him in determining the truthfulness of a witness. It can be used to cross-examine a witness during investigation so as to come with the true procedure of the evidence.

By the Hon'ble Supreme Court's judgment in *State v. Chaudhary* has not only eliminated the absurdity relating to typescript but it has also provided the guidelines for the induction of new types of scientific evidence. The question while arose here that who is expert then. However this section is silent on other aspects of forensic evidence that can be admissible in court in criminal proceeding. The right against self-incrimination, widely known as the right to silence is enshrined in the Code of Criminal Procedure. The foundation on which expert's evidence rests is the supposed superior knowledge or experience of the expert in relation to the subject-matter upon which he is permitted to give an opinion as evidence. The credibility of an expert witness depends on the strength of the reasons stated in support of his conclusions and the data and materials furnished, which form the basis of his conclusion.⁹⁹ The evidence of an expert is considered rather a weak type of evidence and the Courts do not generally consider it as offering "conclusive" proof and therefore, safe to rely upon the same without seeking independent and reliable corroboration.¹⁰⁰ It has also been held that it is unsafe to convict the accused solely on the basis of expert opinion.¹⁰¹ Expert opinion evidence may be contradicted and cross-examined, like any other evidence. The position of an expert is that he must be regarded as any other independent witness, and although he enjoys such weight as may follow from his peculiar ability to assist the court, it will be a misdirection to direct the jury that his evidence could be accepted unless the witness himself betrays

97 Dr. Subhodh Kumar Singh, "Admissibility of Polygraph test in Indian Administration of Criminal Justice Sysytem" 1CrLJ 78(2012).

98 AIR 2007SC 1218.

99 *State of H.P. v. Jai Lal* (1999) 7 SCC 280.

100 *S.Gopal Reddy v. State of A.P.* (1996) 4 SCC 596.

101 *Mahmood v. State of U.P.* AIR 1976 SC 69.

reasons for rejecting it. There will be occasions where the evidence may have to be rejected on the procedural grounds and occasions where the court will have to choose between conflicting opinions from experts dealing with the same matters.

6.11 Admissibility of Polygraph Tests as Evidence: A Glimpse

The polygraph lie-detector technique for the detection of deception has been definitely established as a valuable investigative aid. It assists in the exoneration of the innocent as well as in the apprehension of the guilty. As with any diagnostic device or technique, however, the accuracy and validity of polygraph test results depend to a very great degree upon the competency and integrity of the examiner himself.¹⁰² As the uses of Polygraph techniques have grown in recent criminal investigations and evidence, there is increasing concern about the factors that may adversely affect their accuracy and their uses in administrative and judicial proceeding.¹⁰³ Thus the High Court of Gujarat has held that “The legality, validity or evidentiary value of the Lie Detector test is again a question which has to be determined at the trial.”¹⁰⁴

In yet another case the accused was subjected to lie detection test and the honourable court held it admissible under section 293 of Cr.P.C. The court observed as per the provisions of Section 293 of the Criminal Procedure Code, any document purporting to be a report under the hand of Government scientific expert, upon any matter, duly submitted to him for examination or analysis and report in the course of any proceedings under the Code may be used as evidence in any trial conducted under the Code. As per Sub-section (4) (e), the Section 293 applies to the Director of a State Forensic Laboratory. Therefore, there is no need to examine the expert unless the Court feels it necessary. However, it is only opinion evidence, which requires further corroboration.¹⁰⁵

The High Court of Gujarat has observed that for the detection of while collar crimes, it is expected from the State to undertake the investigation through ultra modern machineries like Lie Detection test, Narco-Analysis test etc.¹⁰⁶

102 “An demy of Polygraph (“Lie Detector”) Examiners” available at: www.jstore.org/stable/1139536 (visited on date 04-12-2014).

103 Murray Kleiner (ed.), Handbook of Polygraph Testing 34 (Academic Press, New York, 2002).

104 *Abbasbaig Habibbaig Mirza v. State of Gujarat* (2005) 3 GLR 2418.

105 *Yelchuri Manohar v. State of A.P.* 2005CriLJ 4593.

106 *Brown v. Walker* (1896) 161 US 596.

The Bombay High Court upheld the legality of Polygraph test in the case of *Ramachandran Reddy v. State of Maharashtra*¹⁰⁷. In this case the court upheld special court's order of Pune, allowing the SIT to conduct scientific tests on the accused in the fake stamp paper scam including the main accused, Abdul Karim Telgi. The verdict also said that the evidence procured under the effect of Lie-Detector test is also admissible. In the course of the judgment, a distinction was drawn between "statement" (made before a police officer) and "testimony" (made under oath in court). The judge, justice Palshikar and justice Kakade said that the Lie Detector and the Brain mapping test did not involve any "statement" being made and the statement made under Narco-Analysis test was not admissible in evidence during trial. The judgment also held that these tests involve "minimum bodily harm".

Again in *Sasntokhben Sharmanbhai Ladeja v. State of Gujarat*¹⁰⁸, the court observed that "when after the exhausting all the possible alternative to find out the truth and nab the criminal/accused and when it is found by the prosecuting agency that there is no further head-way in the investigation and they are absolutely in dark, there is a necessity for such a test. On the basis of revelation and/or the statement recorded while conducting /performing the Narco-Analysis test, prosecuting agency may have some clues which would further help and/or assist the investigation agency to further investigate the crime and at this stage, there will not be any bar of the Article 20(3) of the Constitution of India and merely conducting /performing the Narco-Analysis test on the accused, the protection guaranteed under Article 20(3) of the Constitution of India is not violated. As stated above, only at the stage when the prosecution agency is likely to use such statement as evidence and if it is inculcating and incriminating the person making it, it will attract the bar of article 20(3)." The court further observed that various provisions under the criminal Procedure Code right from Section 156 to 159 and other related provisions, collection of evidence by the police officer is permitted under the law. Conducting the Narco-Analysis test on the accused is to be considered as process of collection of such evidence by the investigation agency. The investigating agency cannot be prevented to interrogate the accused at the stage of investigation and restraining the Investigation Agency to further investigate the crime though the aforesaid two test would tantamount to

107 2004 ALL MR (Cri) 1704.

108 2008CrILLJ 68.

interfere with the right of the investigating agency to investigate the crime of which it is statutory authorized. In this case, the accused person was involved in fake stamp case. The accused brought for Polygraph test. He was first interviewed and interrogated and it was forced that he was concealing some relevant information. It was also found that he was also suspected to be lying about involvement of politician and police officers in fake stamp paper. On next day he was produced for Brain Mapping test. It was held by the court about the report of admissibility of Brain mapping test that no material placed on record to show as to how for the report can be relied on and report appear to be vague. Whether scientific tests are admissible or not, it will depend upon its authenticity.

The most recent famous is *Badaun Rape Case, 2014*, in which two girls age 14 and 15 year were missing from 27 May 2014. Their bodies were found hanging from a mango tree in the village in Ushait area on May 28. In this case, CBI conducted the Polygraph test on June 26, 2014 on the four persons of the family member of the girls, to find out the truth, because CBI was not satisfied with the statement given by the family members regarding the murder of the girls. In this case for conducting the Polygraph test on the persons, CBI has taken the consent from the concerned persons. A Central Forensic Science Laboratory team carried out the polygraph test on the accused person. CBI asked several question from the accused person related with the crime without revealing the process of the test to find out the real truth. At present the case is pending before the court.

There are many cases in which the accused person has refused from conducting the Polygraph test. For example, Patna police has started resorting to polygraph test in cracking complicated murder cases. As it is hard to accuse a kin of the deceased, the cops prefer to opt for polygraph test to get evidential support in their investigations. But, unfortunately, the suspect has the legal rights to deny any such test, leaving many case relating with murder unsolved. In 2011, in another sensational case of *Sitaram murder*, a retired All India Radio employee, Sitaram Yadav, was killed by unknown assailants and the case is still unsolved. Yadav was murdered with a hammer and the assailants had decamped with cash and valuables from his resident. In this case, the police were under the thought that it was a murder for gain but it does not seem the case. Yadav's body was found outside his house. The police supposed that the murder of Sitaram Yadav was not committed in the house. The police wanted

to use a lie-detector on Yadav's wife Shakuntala Devi, who was in the house when the crime took place. But she refused to undergo the test," said a senior police officer.

The amazing murder of **Santosh Tekriwal**, the owner of Azad Transport Agency, on July 10, 2009 is however to see any breakthrough. The Central Bureau of Investigation (CBI) is investigating the case. In this case, the investigation team wanted to conduct the polygraph test on the persons who were present at the time of murder of Santosh Tekriwal. But all of them refused from conducting the Polygraph test on them.

Earlier, the widow of slain Patna businessman Satyendra Singh demanded that a polygraph test be conducted outside Bihar on former MP Vijay Krishna, who has been convicted in the case of abduction and murder of her husband. She alleged that Krishna had influenced the director of the State forensic laboratory as he refused to conduct the polygraph test on the accused on medical grounds.

Likewise in July last year, a 40-year-old principal of a private school, **Neelam Sharma**, was beaten to death at her Patna residence under Patliputra police station. The murderer is still unidentified. Patna SSP Manu Maharaaj said that the police requested Sharma's husband to undergo a lie-detector test but he refused. "The accused are guarded by law, that no one can force the suspect to appear against himself. So, we cannot force anybody to appear for the test," he lamented.

Now, Patna police are going to request for polygraph test of Prabhu Gupta, son of city-based businessman Ramji Prasad Gupta, in connection with his murder. Ramji was shot dead on October 24 in the car parking of his Jagkailash Apartment at Patliputra Road No. 3 under Pataliputra police station area.¹⁰⁹

6.13 NHRC'S Guidelines on the Administration of Lie Detector or Polygraph Test:

Test on a suspect accused. The Commission, in 16 May 1997, had received a petition dated 12 May 1997 from Shri Inder P. Chaudhry, a resident of New Delhi, while he was lodged in the Shimla Sub-jail. The petitioner had alleged that while visiting Shimla to attend the hearing of a civil suit, he had been arrested by the Shimla

¹⁰⁹ "Police rely on polygraph test in unsolved murder cases", *available at*: www.legalservice.com (visited on date -04-12-2014).

Police in connection with a murder and thereafter had been subjected to various kinds of custodial torture for a period of 13 days of police custody. He had been illegally detained and tortured both physically and mentally and subjected to 'Lie Detector Test' without his consent and thereafter he had been administered certain intravenous drug. He had prayed that the Commission might look into his case and get the matter inquired by the CBI independently.¹¹⁰

The case was originally considered by a Member of the Commission on more than once occasion. The Learned Member did not find it a fit case for intervention by the Commission. The petitioner had sought review of the order of the commission. The review petition was placed before the same Bench in terms of Regulation 32 (b) of the National Human Rights Commission Procedure (Regulation), 1994. The Bench disposed of the review petition by an order dated 8 September 1998. Later the petitioner filed another petition dated 14 September 1998 for review. The case was later listed before the Chairperson. The petitioner along with his Counsel was heard on this matter and he had admitted that almost every allegation made in the petition before the Commission formed part of the Writ Petition filed before the High Court of Himachal Pradesh which had since been dismissed. A special leave petition also been filed before the Supreme Court which had also been dismissed.¹¹¹

As the complainant had also approached the High Court of Himachal Pradesh with a writ petition and later the Supreme Court with a writ petition and later the Supreme Court of India with a special Leave Petition but without success, the Commission declined to intervene in the matter. Subsequently, the review petitions filed by Shri I.P. Chaudhry were also dismissed. While dismissing his last review petition vide an order dated October 1999, the commission had observed, that as the Lie Detector Test to be administered to an accused is not regulated by Law, it is appropriate that concrete guidelines for the test should be formulated. It also observed that, however, apart from and as not applicable to the present case, the Commission may have to consider formulating appropriate guidelines for the conduct of "Polygraph test".¹¹²

¹¹⁰ *Supra* 87, 257.

¹¹¹ *Ibid.*

¹¹² *Ibid.*

Accordingly, a set of guidelines relating to administration of Polygraph Test was formulated and approved by the Commission. The Commission considering this aspect felt that as the Polygraph test was not regulated by Law it was appropriate that guidelines pertaining to the test should be formulated.¹¹³

The National Human Rights Commission on 12 November 1999 adopted a set of guidelines relating to administration of the Polygraph Test or the Lie Detector Test. The Commission had been receiving a number of complaints pertaining to the conduct of this test. It is allegedly conducted after a certain drug is administered to the accused. As the existing police practice in invoking Lie Detector Test is not regulated by any 'Law' or subjected to any guidelines, the Commission felt that it could tend to become an instrument to compel the accused to be a witness against himself, violating the Constitutional immunity from testimonial compulsion.¹¹⁴

The serious matters concerning invasion of privacy have received anxious consideration from the Courts too. A suggestion for legislative intervention was made, in so far as matrimonial disputes were concerned. American Courts had taken the view that such steps are routinely a part of everyday life and had upheld their consistency with due process. To hold that because the privilege against testimonial compulsion protects only against extracting from the persons own lips and the life and liberty provisions are not attracted, may not be wholly satisfactory. In India's context, the immunity from invasiveness (as an aspect of Article 21) and from self-incrimination (Article 20(3)) must be read together. The general executive power cannot intrude on either Constitutional rights or liberty or, for that matter any rights of a person. In the absence of a specific 'law', any intrusion into fundamental rights must be struck down as constitutionally invidious. The Lie Detector Test is much too invasive to admit of the argument that the authority for this test comes from the general power to interrogate and answer questions or make statements. However in India, we must proceed on the assumption of Constitutional invasiveness and evidentiary impermissiveness to take the view that such holding of tests is a prerogative of the individual not an empowerment of the police. In as much as this invasive test is not authorized by law, it must regarded as illegal and unconstitutional unless it is voluntarily undertaken under non-coercive circumstances. If the police

¹¹³ *Ibid.*

¹¹⁴ *Id.*

action of conducting a Lie Detector Test is not authorized by law and impermissible, the only basis on which it could be justified is that if it has volunteered.¹¹⁵

However, there is distinction between 'volunteering' and 'being asked to volunteer.' This distinction is some significance in the light of statutory and Constitutional protections available to any person. There is a vast difference between a person saying, 'I wish to take a Lie Detector Test because I want to clear my name'; and the person was told by the police, "If you want to clear your name, take a Lie Detector Test." A still worse situation would be by the police saying "Take a Lie Detector Test and we will let you go." In the first situation, the person voluntarily wants to take the test. It will still have to be examined whether such volunteering was under coercive circumstances or not. In the second and third situations the police implicitly/explicitly link up the undergoing of the test to allowing the accused to go free.¹¹⁶

The extent and nature of 'self-incrimination' is wide enough to cover the kinds of statements that were sought to be induced. The test retains the requirement of personal volition and states that self-incrimination must mean conveying information based upon the personal knowledge of the person giving information. The information, sought to be elicited in a Polygraph test, is always information in the personal knowledge of the accused.¹¹⁷

The Commission, after bestowing its careful consideration of this matter of great importance laid down, the following guidelines relating to the administration of Lie Detector Test:

No Lie Detector Test should be administered without the consent of the accused. Option should be given to the accused as to whether he wishes to avail the test. If the accused volunteers for the tests, he should be given access to a lawyer. The police and the lawyer should explain the physical, emotional, and legal implication of such a test to him. The consent should be recorded before a Judicial Magistrate. During the hearing before the Magistrate, the accused should be duly represented by a lawyer. At the hearing, the person should also be told in clear terms that the statement that is made shall not be a 'confessional' statement to the Magistrate but will have the

¹¹⁵ *Ibid.*

¹¹⁶ *Ibid.*

¹¹⁷ *Ibid.*

status of a statement made to the police. The Magistrate shall consider all factors relating to the detention including the length of detention and the nature of interrogation. The actual recording of the Lie Detector Test shall be done in an independent agency (such as a hospital) and conducted in the presence of a lawyer. A full medical and factual narration of the manner of information received must be taken on record.¹¹⁸

Thus it can be said that before conducting the Polygraph test following guidelines must be followed:

- No Lie Detector Tests should be administered except on the basis of consent of the accused. An option should be given to the accused whether he wishes to avail such test.
- If the accused volunteers for a Lie Detector Test, he should be given access to a lawyer and the physical, emotional and legal implication of such a test should be explained to him by the police and his lawyer.
- The consent should be recorded before a Judicial Magistrate.
- During the hearing before the Magistrate, the person alleged to have agreed should be duly represented by a lawyer.
- At the hearing, the person in question should also be told in clear terms that the statement that is made shall not be a “confessional” statement to the Magistrate but will have the status of a statement made to the police.
- The Magistrate shall consider all factors relating to the detention including the length of detention and the nature of the interrogation.
- The actual recording of the Lie Detector Test shall be done in an independent agency (such as a hospital) and conducted in the presence of a lawyer.
- A full medical and factual narration of manner of the information received must be taken on record.¹¹⁹

6.14 Procedure to be followed by Police Officers for using the Polygraph:

- The Investigating Officer (I.O) should ask the suspect/accused whether he/she wishes to avail the test.

¹¹⁸ *Id.*

¹¹⁹ *Id.*

- If the suspect/accused does not volunteer to undergo the test, write a C.D. stating so and inform the superior officer.
- If the accused volunteers to undergo the test his consent should be recorded before a Judicial Magistrate and access to a lawyer should be given. The I.O. should file an application in the jurisdictional Court and request the judge to record the consent of the suspect accused.
- The suspect/accused should be given access to a lawyer and the physical, emotional and legal implications should be explained to the suspect/accused. by the I.O. and his lawyer.
- The Prosecutor should inform the suspect/accused at the hearing i.e. when the consent is about to be recorded that the statement made shall not be a “confessional” statement to the Magistrate but will have the status of a statement made to the police.
- After the consent is recorded, the I.O. should meet the Joint Director of A.P. State FSL at Hyderabad and give the full facts of the case and the doubts, apprehensions about certain aspects for which suspect/accused was unable to give or which the I.O. could not obtain. He will prepare a set of questions to be administered to the suspect/accused.
- The I.O. will then discuss these questions with the superior officer and after finalization should either bring the suspect/accused to the FSL in Hyderabad for the Test or send the Polygrapher to the location where the suspect/accused is, as per the choice of suspect/accused.
- While conducting the test ensure that the test is conducted in the presence of a lawyer and preferably a doctor.
- After the test is over take the report from the Joint Director, FSL and discuss with the superior officer for further necessary action.¹²⁰

6.14 Conclusion

In present days, the techniques used by the criminals for commission of crime are very complicated and modern. The predictable technique of questioning may not

¹²⁰ T. Murali Krishna,” *Polygraph test (Lie –Detector Test) and Truth Serum*” available at www.Polygraph.com (visited on date 05-10-2010).

submit any fruitful result at all. That is why the scientific tests like Polygraph, Brain Mapping, Narco-Analysis, etc. are now frequently used in the investigation of a case. When such tests are conducted in extreme necessity, strict supervision of the competent expert, it cannot be understood that there is any violation of the fundamental rights guaranteed to a citizen of India.

In India this technique has proved to be a quite helpful technique. With the help of this technique various criminal cases have been successfully solved by the various courts. It has become an imminent requirement for the state Government to work with the Central Authorities in order to develop the analytical capabilities of their police departments. Due to the sophisticated modes and changing conditions of committing crimes by the shrewd criminals there is a dire need to apply the new scientific technique like Polygraph test.¹²¹

By and large, the lie-detector evidence has limited judicial recognition. In a few courts of America, Polygraph test results have been recognized for their value as an aid to investigation and in some cases the expert evidence relating to Polygraph has been accepted. The experts in the areas like fingerprints, firearms, identification questioned documents etc. have been widely acclaimed. But the Polygraph experts have not received acceptance and recognition from the court. It is unfortunate because the Polygraphists have established 95 to 98% accuracy of the Lie Detector in detecting deception or the truthfulness of the subjects in criminal investigations. On the basis of relevant scientific data on Lie Detection, it is strongly felt that the courts should accept this deception test because it can furnish a fairly effective method and technique for the exposure of deception in a subject. Since Polygraph interrogation is the best available method to detect deception, the time has come for the courts to admit this type of evidence with impunity in criminal investigation.

In India, a good beginning was made by the Central Forensic Science Laboratory, Central Bureau of Investigation, New Delhi by providing the facility of Polygraph for the crime investigation purposes. The tests have not been utilized in the courts. However there is no law which forbids the use of Lie Detector. It is the humble opinion of the researcher that the scope of section 45 of the Indian Evidence Act must be made function wide enough to accept the Polygraph evidence also. Lastly

121 Barcelona Panda "Narco-Analysis and its Evidentiary Value in India" PL July s(2011) available at: www.supremecourtcases.com (visited on date 15-07-2012).

in the words of Wicker of the college of Law University of Tennessee “If and when convincing evidence is produced that are reasonably reliable, scientific methods of exposing falsehoods either in or out of the court rooms are available, these methods should be promptly utilized by the legal profession”.

Chapter VII

Scientific Analysis of Forensic Science and its Implication in the Protection of Human Rights: An Appraisal

SCIENTIFIC ANALYSIS OF FORENSIC SCIENCE AND ITS APPLICATION IN THE PROTECTION OF HUMAN RIGHTS: AN APPRAISAL

7.1 Introduction

“All human beings are born free and equal in terms of dignity and their rights. They are endowed with reason and conscience and should act towards one another in a spirit of brotherhood.”¹

“India with all its thousands of years of cultural heritage and Vedic vintage, has not been able to assure to its people even a pretence of the preamble, ground undertaking of Justice, Liberty, Equality, and Fraternity to citizen.”

Justice V.S. Krishna Iyer

Human rights are those natural rights which every human is entitled to possess being a human being. Though a very ancient concept, the present day nomenclature appeared only during the last century, where violation of natural fundamental rights escalated.² The concept of human rights though is central to political science, it is poorly understood. There is no agreement on its meaning nature and contents. It is a concept very much contested not only between East (representing former socialist) and West (representing liberal democratic states) but also between developed and developing countries. Each group of nations had a different perception of human rights.³

The newly emerging states of the Third World, while adopting the eastern or western model of human rights paradigm in their combination of both, focused on solidary or group rights such as rights to self-determination of people's including sovereignty over their natural resource, the rights to develop healthy and ecologically balanced environment, the right to common heritage of mankind. They also insisted on interdependence and individual of civil and political rights to economic rights and social rights.

Thus, the modern concept of human right is much comprehensive in its nature and content. It includes three types of rights: civil and political; economic, social and

1 Rahul Rai, *Human Rights Initiatives I* (Global Vision Publishing House, New Delhi, 2011).

2 Prakash Mishra, *Human Rights in India I* (Cyber Tech Publication, New Delhi, 2012).

3 Abdul P. Vijapur, *Human Rights in International Relation I* (Manak Publication Pvt. Ltd. 2010).

cultural and the emerging collective or group rights. Human rights are those conditions of life that allow us to fully develop and use our human qualities of intelligence and conscience in order to satisfy our spiritual needs. Human rights far from being an abstract subject for philosopher, political scientist and lawyer, affect the daily lives of everyone –man, women and the children.⁴

Human rights are universal. No one has to earn or be worthy of human rights. Human rights are unchallengeable: one cannot lose these rights any more than one can cease to be a human being. Human rights are indivisible: one cannot be denied a right because someone decides that it is less important or “non essential”. Human rights are autonomous: all human rights are part of complementary framework.⁵ Human rights are essentially a product of democracy. They are the rights, particular social practices to realize those values. A human right should not be confused with the value or aspiration underlying it or with enjoyment of the object of the right.

Principles that set out certain standards of human behaviour, and are regularly protected as legal rights in national and international law. They are “commonly understood as inalienable fundamental rights to which a person is inherently entitled simply because she or he is a human being.” Human rights are thus conceived as universal (applicable everywhere) and egalitarian (the same for everyone). The doctrine of human rights has been highly influential within international law, global and regional institutions. Policies of States and in the activities of non-governmental organizations and have become a cornerstone of public policy around the world. *The idea of human rights* suggests, “If the public discourse of peacetime global society can be said to have a common moral language, it is that of human rights.” The strong claims made by the doctrine of human rights continue to provoke considerable skepticism and debates about the content, nature, and justifications of human rights to this day. Indeed, the question of what is meant by a “right” is itself controversial and the subject of continued philosophical debates.⁶

The development of human rights movement can be understood by looking at its political beginnings, conceptual reach, evolution and scope, and the agent of that movement. The term ‘human right’ is relatively new, but aspect of its available

⁴ *Id.*19.

⁵ Varun Naik and Mukesh Sahai, *Human Rights Education and Training* 1, (Crescent Publication, 2011).

⁶ “Human Right”, available at: http://en.wikipedia.org/wiki/Human_rights visited on 05-06-2014.

meaning are very old. All the major religions ,including Buddhism, Christianity ,Hinduism and Islam, speak of the inherent dignity of the individual or the sacred nature of the human personality .Our Conventional international law of human rights is linked with the ideas having roots in natural law (as propounded in many western countries) and Roman laws. Political thinkers such as Jhon Loke (1632-1704) and Jean –Jacques Rousseau (1712-1778) and legal scholar such as Fransisco Suarer (1549-1617), Hugo Grotius (1583-1648), and Emmerich De Vattel (1714-1767) have also contributed our current understanding of both natural and its human rights contents.⁷Human rights are those basic entitlement and freedom that make our lives satisfying and meaningful .To be free from fear, free from deprivation and to have the opportunities to achieve all that we are capable of is a fundamental human aspiration .That is why human rights are sometimes called “natural rights”. Because no one gives these rights and no one can legitimately take them away, human rights are supposed to be ‘unchallengeable’. Human rights are also recognized as being ‘universal’, which means they belong to and are enforceable by everyone –no matter what their race, religion, caste sex social or economic status, disability or place of birth is. At the heart of the idea of human rights is the notion that all the people are born free and equal. Everyone is entitled to live with dignity and no one, neither the state nor the community, nor the family, nor society has any right to criminate or trait any one unfairly or unjustified.⁸

“Human Rights” means the rights relating to life, liberty, equality, and dignity of the individual guaranteed by the Constitution or embodied in the International covenants and enforceable by the courts in India.⁹ Human rights are universal and are bright right of every member of the human family. No one has to earn or deserve human right. Human rights are inalienable: one cannot lose these rights any more than one can cease to be a human being. Human rights are indivisible¹⁰.

Human rights are essentially a product of democracy and are not just abstract values such as liberty, equality, and Security. They are the rights, particular social

7 S.R.Chauhan and M.S Chauhan, *International Dimension of the Human Rights* 1 (Global Vision Publishing House, New Delhi, 2012).

8 Mandeep Tiwari, Sneh Arora, et.al, *Human Right Commission: A Citizen Handbook* 15 (Matrix, New Delhi, June 2006).

9 http://en.wikipedia.org/wiki/National_Human_Rights_Commission_of_India (visited on date 15-05-2014).

10 Varun Naik and Mukesh Sahai, *Human Rights Education and Training* 1, (Crescent Publication, 2011).

practices to realize those values. Human rights should not be confused with the value or aspiration underlying it or with enjoyment of the object of the right. The development of human rights movement can be understood by looking at its political beginnings, conceptual reach, evolution and scope, and the agent of that movement.¹¹

In modern World, the human rights idea and its protection and has become universal and has virtually been accepted by all the Nation, States, and Society respectively. In the modern times Human Rights have become an absolute movement. International Organization Governmental and Non-Governmental agencies have continuously been exploring the dynamics of human rights and have been working to evolve such mechanism which could safeguard the rights of human beings.¹²

7.2 Historical Perspective of Human Rights

The origin of human rights may be found both in Greek philosophy and the various world religions. In the Age of Enlightenment (18th century) the concept of human rights emerged as an explicit category. Man/woman came to be seen as an autonomous individual, endowed by nature with certain inalienable fundamental rights that could be invoked against a government and should be safeguarded by it. Human rights were henceforth seen as elementary preconditions for an existence worthy of human dignity.

Before this period, several charters codifying rights and freedoms had been drawn up constituting important steps towards the idea of human rights. During the 6th Century, the Achaemenid Persian Empire of ancient Iran established unprecedented principles of human rights. Cyrus the Great (576 or 590 BC - 530 BC) issued the Cyrus cylinder which declared that citizens of the empire would be allowed to practice their religious beliefs freely and also abolished slavery. The next generation of human rights documents were the *Magna Charta Libertatum* of 1215, the Golden Bull of Hungary (1222), the Danish Erik Klipping's *Håndfaestning* of 1282, the *Joyeuse Entrée* of 1356 in Brabant (Brussels), the *Union of Utrecht* of 1579 (The Netherlands) and the English *Bill of Rights* of 1689. These documents specified rights which could be claimed in the light of particular circumstances (e.g., threats to the freedom of religion), but they did not yet contain an all-embracing philosophical

11 "Human Rights", available at: www.hinduonline.com (visited on date 20-03-2012).

12 *Ibid.*

concept of individual liberty. Freedoms were often seen as rights conferred upon individuals or groups by virtue of their rank or status.¹³

In the centuries after the Middle Ages, the concept of liberty became gradually separated from status and came to be seen not as a privilege but as a right of all human beings. Spanish theologians and jurists played a prominent role in this context. The work of Francisco de Vitoria (1486-1546) and Bartolomé de las Casas (1474-1566) must be highlighted. These two men laid the (doctrinal) foundation for the recognition of freedom and dignity of all humans by defending the personal rights of the indigenous peoples inhabiting the territories colonised by the Spanish Crown.¹⁴

The Enlightenment was decisive in the development of human rights concepts. The ideas of Hugo Grotius (1583-1645), one of the fathers of modern international law, Samuel von Pufendorf (1632-1694), and of John Locke (1632-1704) attracted much interest in Europe in the 18th century. Locke, for instance, developed a comprehensive concept of natural rights; his list of rights consisted of life, liberty and property. Jean-Jacques Rousseau (1712-1778) elaborated the concept under which the sovereign derived his powers and the citizens their rights from a social contract. The term human rights appeared for the first time in the French *Déclaration des Droits de l'Homme et du Citoyen* (1789).¹⁵

The people of the British colonies in North America took the human rights theories to heart. The American Declaration of Independence of 4 July 1776 was based on the assumption that all human beings are equal. It also referred to certain inalienable rights, such as the right to life, liberty and the pursuit of happiness. These ideas were also reflected in the Bill of Rights which was promulgated by the state of Virginia in the same year. The provisions of the Declaration of Independence were adopted by other American States, but they also found their way into the Bill of Rights of the American Constitution. The French *Déclaration des Droits de l'Homme et du Citoyen* of 1789, as well as the French Constitution of 1793, reflected the emerging international theory of universal rights. Both the American and French Declarations were intended as systematic enumerations of these rights.¹⁶

13 "Human rights definition and classification", available at : <http://www.humanrights.is/the-human-rights> (visited on date 05-06-2014).

14 *Id.*

15 *Ibid.*

16 *Ibid.*

The classic rights of the 18th and 19th centuries related to the freedom of the individual. Even at that time, however, some people believed that citizens had a right to demand that the government endeavour to improve their living conditions. Taking into account the principle of equality as contained in the French Declaration of 1789, several Constitutions drafted in Europe around 1800 contained classic rights, but also included articles which assigned responsibilities to the government in the fields of employment, welfare, public health, and education. Social rights of this kind were also expressly included in the Mexican Constitution of 1917, the Constitution of the Soviet Union of 1918 and the German Constitution of 1919.

In the 19th century, there were frequent inter-state disputes relating to the protection of the rights of minorities in Europe. These conflicts led to several humanitarian interventions and called for international protection arrangements. One of the first such arrangements was the Treaty of Berlin of 1878, which accorded special legal status to some religious groups. It also served as a model for the Minorities System that was subsequently established within the League of Nations.¹⁷

The need for international standards on human rights was first felt at the end of the 19th century, when the industrial countries began to introduce labour legislation. This legislation -which raised the cost of labour - had the effect of worsening their competitive position in relation to countries that had no labour laws. Economic necessity forced the states to consult each other. It was as a result of this that the first Conventions were formulated in which states committed themselves *vis-à-vis* other states in regard to their own citizens. The Bern Convention of 1906 prohibiting night-shift work by women can be seen as the first multilateral Convention meant to safeguard social rights. Many more labour Conventions were later to be drawn up by the International Labour Organisation (ILO), founded in 1919. Remarkable as it may seem, therefore, while the classic human rights had been acknowledged long before social rights, the latter were first embodied in international regulations.¹⁸

The atrocities of World War II put an end to the traditional view that states have full liberty to decide the treatment of their own citizens. The signing of the Charter of the United Nations (UN) on 26 June 1945 brought human rights within the

¹⁷ *Id.*

¹⁸ *Ibid.*

sphere of international law. In particular, all UN members agreed to take measures to protect human rights. The Charter contains a number of articles specifically referring to human rights. Less than two years later, the UN Commission on Human Rights (UNCHR), established early in 1946, submitted a draft Universal Declaration of Human Rights (UDHR) to the UN General Assembly (UNGA). The Assembly adopted the Declaration in Paris on 10 December 1948. This day was later designated Human Rights Day.¹⁹

During the 1950s and 1960s, more and more countries joined the United Nation. Upon joining, they formally accepted the obligations contained in the UN Charter, and in doing so subscribed to the principles and ideals laid down in the UDHR. This commitment was made explicit in the Proclamation of Teheran (1968), which was adopted during the first World Conference on Human Rights, and repeated in the Vienna Declaration and Programme of Action, which was adopted during the Second World Conference on Human Rights (1993). Since the 1950s, the UDHR has been backed up by a large number of international Conventions. The most significant of these Conventions are the International Covenant on Civil and Political Rights (ICCPR) and the International Covenant on Economic, Social and Cultural Rights (ICESCR). These two Covenants together with the UDHR form the International Bill of Human Rights. At the same time, many supervisory mechanisms have been created, including those responsible for monitoring compliance with the two Covenants.²⁰

Human rights have also been receiving more and more attention at the regional level. In the European, the Inter-American and the African context, standards and supervisory mechanisms have been developed that have already had a significant impact on human rights compliance in the respective continents, and promise to contribute to compliance in the future.²¹

7.3 Human Right under Human Rights Declaration: Concept and Analysis

Human rights are generally manifested in the individual and collective living of the people with liberty and equality and their concomitant attributes. The

¹⁹ *Ibid.*

²⁰ *Ibid.*

²¹ *Id.*

contentment of the human right obviously come to be developed with the development of society²². Particular with respective representative government having Constitutional norms for governance. Consequently, preservation of the basic rights of the people became a basic norms of governance. Since it is the state which come to be entrusted with power to govern the basic of fundamental rights come to be jealously guarded the state power and the functionaries of the states.²³

The United Nation Charter, which comes into being in 1945, is, however, the first international mechanism that incorporate human rights as a concept and made the promotion and protection of those rights, one of the purposes of the individual and collective obligation of states. In turn, that purpose and its associated international; obligation, were informed by four things :a perceived need during World War II to recognize human rights, the Holocaust, a fundamental aim of the U.N., and an agreed on means to realize that aim. The Universal Declaration of human Rights was adopted by United Nation on Dec., 10, 1948. This declaration has only been “a common standard of achievement for all people and all nation”, but the source of moral inspiration for all other human rights, instrument.²⁴ The General Assembly proclaimed:

This Universal Declaration of human Rights as a common standard of for all people and all nation to the end that every individual and every organ of society, keeping this declaration constantly in mind, shall strive by teaching and education to promote respect for these freedom and by progressive measure, national and international to Secure their universal and effective recognition and observance, both among people member states themselves and among their jurisdiction.²⁵

The National Human Rights Commission (NHRC) was constituted under the Protection of Human Rights Act on 12th, October, 1993. This Act drew its inspiration mostly from international covenants like that of Civil and Political Rights and the International Covenant on Economic, Social and cultural Rights adopted by the General Assembly of the United Nations on the 16th December, 1966. Even in defining human rights, the Act has mentioned about these covenants frequently.²⁶

22 Vijya Kumar, “Human Rights and Criminal Justice System in India”, XVI CILJ397 (2003).

23 *Id.* 598.

24 S.R.Chauhan and M.S.Chauhan, *International Dimension of the Human Rights* 3 (Global Vision Publishing House 2012).

25 Paras Diwan and Piyush Diwan, *Human Rights and the Law; Universal and Indian* 9 (Deep and Deep Publication, New Delhi, 1998).

26 Pawan Sinha, “Chapter on National Human Right Commission (NHRC)”, IV CriLJ 155(2011).

According to the Protection of Human Rights Act 1993, the National Human Rights Commission was constituted for the better protection of human rights and the matters connected therewith or incidental thereto.²⁷ The protection of the human dignity is a part and parcel of human rights. This is the main object of the National Human Rights Commission is to provides protection to the human beings. It is a object that originate not only from statutes of the commission by from constitution itself, for Article 21 of te Indian constitution , as the Supreme Court interpreted it, means that all those who live in India have a right to a life with human dignity.

The defense of human rights and dignity is an imperative of the Constitution and there should be no doubt or ambivalence on this matter. The greater the power, the greater the responsibility to recognize and to act upon this imperative. Mahatma Gandhi, who had an unrivaled capacity to express the truth with simplicity and directness, put it this way: "It has always been a mystery to me how men can feel themselves honored by the humiliation of their fellow beings." Thus every citizen of India, and especially every functionary of the State, should bear Gandhiji's observation and truth constantly in mind. That would see us move closer to a life with dignity for all.²⁸

The National Human Rights Commission had organized a core Group of specialist to examine all aspects of the forensic science to develop the forensic science services in the country, which are at present greatly in need of attention. The Group studies the laboratories of State forensic science and services available in the country and submitted its report, which was released to the public personally by Shri L.K. Advani, Union Minister for Home Affairs, on 11 January 1998. Copies of the report were thereafter sent to the Ministry of Home Affairs and the Chief Secretaries of all States/UTs. As there was no reaction from the Ministry of Home Affairs to the report, the Commission considered it essential to remind that Ministry, on 9 August 2000, that a response was due. An interim reply was subsequently received from the Ministry of Home Affairs on 5 September 2000, stating that the matter was under consideration. The Commission wrote to the Ministry again, on 10 October 2000, asking for more specific information on the action, if any that was being taken²⁹.

²⁷ *Supra* 2.

²⁸ "Human Rights", available at: www.nhrc.nic.in (visited on date 23-12-2012).

²⁹ *Ibid*.

The Commission was of the firm opinion that the report ready by the center Group of specialist contained numerous important recommendations. The forensic science services in the country are unhappily not adequate. So the Commission urged that the Ministry of Home Affairs and the various State/UT Governments to act promptly on the report, which was with them for over three years. Failure to improve the forensic science services was gravely affecting the administration of criminal justice in the country and leading to the serious violations of human rights.³⁰

7.4 Law relating Human Rights in India

Right to life and personal liberty looms very large in the universal Human Rights Charter. Obviously, the man and woman have been the victims of the deprivation of these rights for centuries and in many societies those rights is still trampled upon with impunity and brazen brutality. It was but natural for the Charter of Universal Right to dwell on all aspects of this right. Art.3 of the Declaration proclaims- Everyone has the right to life, liberty and Security of person³¹. Art.6 of the Second Covenant proclaims the right to life thus; every human being has an inherent right to life and this right shall be protected by law. Likewise Art 9 (1) of the Covenant declared the right to personal liberty thus; everyone has the right to liberty and Security of the person. Similarly Sub Art. (2), (3), and (4) of the Art. 19 deal with other aspects of the personal liberty.

The Constitution of India deals with the Right to Life and Personal Liberty under Art.21 while Art. 20 and 22 deal with the protection of personal liberty against arrest and detention so that human dignity is not violated and human being is treated as human beings.³²

From May 12-14, 2005, the Asian Human Rights Commission (AHRC) held a consultation in Hong Kong with a group of forensic and legal professionals to discuss the interplay between forensic science and human rights. The participants examined how the improved institutions and procedures for forensic investigations are essential to the rule of law and thus to give effective redress to the victims of human rights violations. The participants agreed that the extent to which forensic science is used in

³⁰ *Ibid.*

³¹ Asima Sahu, *Human Right Violation and The Law* 91-92, quoted by Mrs. Shashi Jain (first published in 1999).

³² *Id.*, 93.

criminal investigations has a direct bearing on the scale of human rights violations throughout Asia, particularly torture. Torture is alleged to be the most common method of criminal investigation for police in Asia. Even in those countries that have ratified the U.N. Convention against Torture (CAT) and Other Cruel, Inhuman or Degrading Treatment or Punishment and the International Covenant on Civil and Political Rights (ICCPR), which also absolutely prohibits torture, it is still widespread. However, in few territories of Asia where forensic science is a key part of criminal investigations, such as South Korea and Hong Kong, torture is now rarely used and is usually detected and punished effectively.

To deny the use of forensic science in criminal investigations itself amounts to a serious human rights violation as it permits the continuation of imperfect and violent methods of policing and the gross abuses. Thereafter, if the perpetrator of a crime or a gross violation of human rights is not detected for the want of proper forensic analysis - either inadvertently or deliberately. Where effective remedies are not forthcoming, crime and human rights abuses are further encouraged. Thus, any state that is serious about preventing the crimes and protecting human rights is obliged to improve the quality of criminal investigations, which means using forensic science expertise extensively. The role of forensic experts in criminal investigations throughout Asia is usually limited because of vast powers held by the police. In most of the countries, the police control all areas of criminal investigation while in a few the public prosecutor shares the power. In many nations, the law has not described the role of forensic professionals in detail; in most, their presence in criminal investigations is not obligatory. The result is that the police or prosecutors rarely use forensic experts. Unless systemic changes are made to expand the role of forensic professionals and delimit the power of the police over criminal investigation, this situation is unlikely to change.³³

The shortage of forensic professionals in most parts of Asia is another serious concern. Even in a more developed country like Thailand, for instance, there are only five forensic pathologists. Nowhere are there enough qualified persons available to afford proper services to the public. As a consequence, many suspicious deaths are not properly investigated. Murders and extrajudicial killings may go undetected or be

33 "Violation of human rights through scientific methods", *available at*: www.hrsolidarity.net (visited on date 25-12-2013).

deliberately concealed in the absence of the necessary staff. It follows that increasing the number of forensic experts is a key challenge.³⁴

Obstacles to the wider use of forensic science in criminal investigations must be understood as the obstacles to the protection of human rights and must be taken up by governments and the public in these terms. It is to be noted that in territories where forensic science has become an integral part of criminal investigations it has been due to the presence of people who have dared to speak out. Where for reasons of repression or otherwise people do not talk openly, bad criminal investigations and human rights abuses blatantly persists.³⁵

Forensic specialists should themselves play a much more active role in influencing public opinion towards change. They must talk to people more directly and make them aware of the benefits when independent forensic science facilities are available. They must use the media and other channels for far-reaching communication, both as educators and reformers. As they are in a better position than others to inform the State and the public on the manner in which criminal investigations can be improved through the use of forensic science, they should take advantage of this position to speak with authority and influence.³⁶

Human rights defenders have a responsibility to mediate and expand contact between forensic experts and the public. To play this role, they must learn more about the obstacles to forensic science becoming an integral part of criminal investigations. Where human rights groups limit talks to generalities and avoid going into the details of how to apply theories and instruments of human rights, they are unlikely to effect any significant changes in the complex relations that permit continued abuses in most parts of Asia. For its part, the Asian Human Rights Commission (AHRC) will deep discussion on the relationship between forensic science and human rights and is committed to sharing it with a larger audience throughout this region³⁷.

7.5 Role of Forensic Scientist in Criminal Justice Delivery System

The forensic scientist are also faced with the task of solving puzzling and captivating evidence that are sent for their analysis by the perplexed investigation

³⁴ *Ibid.*

³⁵ *Ibid.*

³⁶ *Ibid.*

³⁷ *Id.*

agencies .What follows will give an idea of what the forensic scientist have to deal with when they try to help the investigating agencies in tracing the criminal.³⁸

There are many worldwide organizations that use the term expert witness, perhaps more than a million in number. Bodies that monitor and maintain strand for single professional group are most likely to be the best initial starting place when seeking a forensic expert. These bodies should not be self-created institution or association ,but those that a national or other gov. recognize as being directly involved in the training and accreditation of the professional group. Forensic expert have a very significant role in the administration of justice. Currently, there are no failsafe means of identifying the best expert or even identifying potential fraudulent expert. All those involved in using expert themselves, must be prepared to question the qualification of an expert to the appropriate authorities if there are serious concerns about their validity and performance.³⁹

In India, if the court has to form an opinion upon a point of science then the opinion upon that point, of a person especially skilled in such science is relevant by virtue of Sec 45 of Indian evidence Act 1972. Thus Sec 45 of Indian Evidence Act 1872, is wide enough to cover all branch of specialized knowledge, although, occasionally doubts have arisen in this regard with the advancement of the scientific and technical knowledge there is tendency to widen the scope of the term “science and art”. The opinions of experts are generally admissible whenever an issue comprises a subject of which knowledge can only be acquired by special training or experience.⁴⁰ As per the proposed the Indian evidence (Amended) Bill, 2003, in Sec 45 of the principle act, for the portion beginning with the words “when the courts has to form an opinion and ending with the words such person are called expert” the following substitution has been suggested –

“When the court has to form an opinion upon a point of foreign law, or of science or art, or as to the identity of handwriting or finger impression or footprint or palm impression or typewriting or usage of trade or technical terms or identity of person animal, the opinion, upon that point of persons specially skilled in such foreign law, science or art, or as to the identity of handwriting, typewriting, finger impression,

38 Durga Pada Das, “Forensic Awareness in India” 3CrLJ 43(2003).

39 *Encyclopedia of Law and Society* 596, vol.2, ed.2007.

40 *Law Society of India v. Fertilizers and Chemical Travencore Ltd .and ors* AIR 1994 Ker. 308.

footprint, palm impression, usage of trade, technical terms or identity of person or animal, as the case may be, are relevant facts such person called experts ”⁴¹

The above substitution was proposed by the recommendation of the 185th Report of the Law Commissions of India in the year 2006 which could not be materialized.⁴²

Section 45 gives the definition of forensic expert. An expert is one who has acquired special knowledge; skill or experience in any science, art, trade or profession, such knowledge may have been acquired by practice, observation or careful studies. The word ‘science’ and the term ‘art’ not being limited to the fine art but having its original sense of handicraft, trade, profession and skill in work which, with advancement of culture has been carried beyond the sphere of the common pursuits of life in to that of artistic and scientific action.⁴³

Forensic expert now are chosen based on the qualities alluded to earlier. However, there is still the possibility that the expert who shout the loudest may get his/her opinion across, particularly in those areas where pure science and analytical techniques are of rarely used personal knowledge remains one of the most common ways in which one identifies an expert to give evidence in a case. It is important for an expert to have experience in giving evidence from opposing “sides” for example, on behalf of the defense as well as prosecution in criminal case. The impartiality of expert who solely provide evidence either for the defense or solely provide evidence for the prosecution term may be subject to accusation of being partisan.”⁴⁴

The role of forensic expert is very crucial. Any wrong unreasoned or careless opinion may cause great injustice either to prosecution or to accused .This means that forensic experts must possess extremely right and additional license and he/she should perform his/her duties properly, carefully and diligently . By giving an opinion on a subject in court a forensic expert becomes a part and parcel of judicial process. In most of the cases the report of forensic expert is respected and given due credit.

41 “185th Repot of Law Commission”, *available at*: lawcommissionofindia.nic.in (visited on date 14-07-2012).

42 Abhijeet Sharma, *Guide to DNA Test in Paternity Determination and Criminal Investigation* 74, with a foreword by Hon’ble Justice Dr. Arijeet Pasayat, Judge of S.C. (Wadhwa Publication, Nagpur 2007).

43 Krishan Vij and Rajesh Biswas, *Basic of DNA and Evidentiary Issues* 112 (Jaypee Brothers Medical Publisher (P) Ltd, New Delhi, 2004).

44 *Supra* 10, 596.

Thus, it is the judge, who is interested in real justice who should therefore, ascertain the facts, incorporate them and operate them in the dissemination of justice. The new generation of the judges should especially be aware of their responsibilities in this regard as in the future evidence will play more significant role. It will be used more frequently, almost in all cases.⁴⁵

The forensic scientist is basically interested in harnessing his knowledge for his pursuits to achieve the two-fold aim of criminal justice- the guilty shall not escape and the innocent shall not suffer. The basic premise in using scientific evidence in criminal justice delivery system is that the forensic scientist is neither a witness for the prosecution nor a witness for the defense, rather he is a witness of the court of law. However, in practice, the government forensic science institutions, as part of the police set up cannot maintain absolute independence at all levels. Moreover, the police investigators generally collect the physical clues and any discrepancy in this regard seriously affects the final scientific results and their impact on the criminal justice process. It is evident that inspite of several limitations today, forensic scientists, as witnesses in a court (whether acting for prosecution or for the defense), make important contribution to the criminal justice process. Apart from their contributions in solving traditional crime cases, the services of forensic scientists are being progressively utilized in the areas of anti-terrorist operations, mass disaster management, cyber crime investigation, human rights protection, environment protection, consumer protection, protection of intellectual property rights, etc. All these aspects primarily concern the welfare of the society. Utilization and application of forensic science in these fields involves adaptation of both, known and newer scientific techniques for crime investigation. In 1993, the Royal Police Commission (US) critically evaluated the role of forensic science in criminal justice delivery system in the United Kingdom and outlined the measures concerning its development, including training as well as the procedures for presenting the expert evidence in the courts of law⁴⁶.

In India, the role played by the Government forensic scientists has been given due recognition in Section 293 of the Code of Criminal Procedure (1973) of

45 Dr. B.R Sharma, *Forensic Science in Criminal Investigation and Crime* 54, (Alia Law Agency, Allahabad, edn. 4, 2011).

46 B.B Nanda and R.K. Tiwari, *Forensic Science in INDIA – A Vision for 21st Century* 7-8 (2001).

the country. Section 293 of the Code of Criminal Procedure (Cr.P.C) entitled "Reports of Certain Government Scientific Experts" is reproduced below:

- (1) Any document purporting to be a report under the hand of a Government scientific expert to whom this Section applies, upon any matter or thing duly submitted to him for examination or analysis and report in the course of any proceeding under this Code may be used as evidence in any inquiry, trial or other proceeding under this Code.
- (2) The court may, if it thinks fit, summon and examine any such expert as to the subject matter of his report.
- (3) Where any such expert is summoned by a Court and he is unable to attend personally, he may, unless the Court has expressly directed him to appear personally, depute any responsible officer working with him to attend the Court, if such officer is conversant with the facts of the case and can satisfactorily depose in the Court on his behalf.
- (4) The Section applies to the following Government scientific experts, namely:
 - a. any Chemical Examiner or Assistant Chemical Examiner to Government;
 - ⁴⁷(b. The Chief Inspector of Explosives ;)
 - c. The Director of the Finger Print Bureau;
 - d. The Director, Haffkeine Institute, Bombay;
 - e. The Director⁴⁸, (Deputy Director and Assistant Director) of a Central Forensic Science Laboratory or a State Forensic Science Laboratory;
 - f. The Serologist to the Government.
 - ⁴⁹(g. Any other Government scientific expert specified by notification by the Central Government for this purpose.)⁵⁰

The sub-clause (1) of this Section makes a departure from the elementary rules of law which state that unless the evidence is given on oath and is tested by a cross-examination, it is not legally admissible against the affected party. This

⁴⁷ Subs. by Act 25 of 2005 , Sec. 26(a), for clause (b) (w.e.f. 23-6-2006). Clause (b) ,before Substitution, stood as under -

"(b) the Chief Inspector of Explosive;"

⁴⁸ Ins. by Act of 45 of 1978, Sec. 21 (w.e.f. 18-12-1978).

⁴⁹ Added by Act 25 of 2005, Sec. 26(b) (w.e.f. 23-6-2006).

⁵⁰ Section 293, Criminal Procedure Code, 1973.

Section makes the report of any of the experts, mentioned at sub-clause (4), admissible as evidence, without calling him as witness in the courts of law. However, it is entirely the discretion of the concerned court to accept the expert opinion report as such, or summon the concerned expert for corroboration and/or clarifications, if any, in the court before accepting it as evidence. If the court does not summon the expert to attend the court as a witness, the evidentiary value of the report remains the same. As per the subclasses (3) and (4) of this Section, any officer, whether he has signed the expert opinion/report or not, may attend the court for the purpose, on behalf of the expert, provided that he is conversant with the facts of the case and can satisfactorily depose in the court of law. The expert evidence is admissible in the court, as one of the documentary evidences⁵¹.

Further, the expert report may be questioned by the court itself, or at the insistence of the defense. The purpose behind this provision of law is that in our existing system of administration of criminal justice, generally the burden of proving the guilt of the accused lies on the prosecution, except in certain cases, where specific provision to this effect is made. The expert is considered as an official witness, who is supposed to clarify his technical reports on specific counts, if required. This is to be done as a prosecution witness in order to prove the guilt of the accused in the court of law⁵².

Inclusion of clause (g) would broaden the base for the application of forensic science to the criminal justice delivery system of India. Any forensic scientist, irrespective of his rank in the laboratory, if considered competent, could be notified by the Government of India for being designated as an "expert".⁵³

It is a hard fact that a large number of cases of chemical analysis of viscera for detection of poison etc. are pending in many forensic science laboratories in India. Notwithstanding the difficulties or handicaps in the forensic science laboratories, the suspects have a right to a speedy trial, as guaranteed under the Constitution of India. The under-trials languish in lock-ups as the speed of the trial gets hampered due to non-availability of scientific evidence. The delay thus results into almost near-denial of Human Rights to the individual, apart from having

51 *Supra* 31, 9.

52 *Id.*, 10.

53 *Supra* 8.

possible adverse effects on the justice delivery system. This problem is not new and in spite of various attempts in the past, it has eluded the solution. Thus the forensic science laboratories are to be suitably upgraded and streamlined. The law enforcement authorities should also carry out some screening of cases and prioritize them before making reference to the forensic science laboratories. In short, an overall adequate scientific capability of an institution and need-based references by the investigators would have to be implemented simultaneously. This has already been done in the advanced countries and can certainly be achieved in our country, if we are really keen and concerned to provide comprehensive legal protection to the society.⁵⁴

Suitable legal provisions and regulatory methods can definitely control the growing menace of narcotics and other psychotropic substances. This also requires analysis of a wide variety of drugs/chemicals on a time bound basis. But in actual practice, long delays are often associated with the process, which result into long stay of under trials in custody. This apart from the drug analysis has become more complex and sophisticated and requires adaptation of validated analytical techniques to be uniformly followed in all the forensic science laboratories. This requirement and its compliance need to be looked into more seriously. Drug laws are generally strict and there is higher possibility of miscarriage of justice due to a non-standard expert opinion. Apart from the time-bound reporting, this aspect must also be brought into focus at the laboratory level. The forensic science laboratories must reorganize themselves and develop in such a manner that their expert opinions are not only dependable but are also time bound. It is evident that the society, for its protection, expects better and prompt services from the forensic scientist. This can be achieved only if this branch of science receives its due priority, as an indispensable tool for dispensation of justice and the protection of human rights in our society.⁵⁵

In *Mukhtar Singh v. State of Punjab*⁵⁶, Supreme Court accepted the Forensic science expert's evidence (produce by prosecution) that the fired cartridges and missed cartridges found at the rifle recovered. In *Raghubir Singh v. State of*

⁵⁴ *Id.*, 94.

⁵⁵ "Forensic Scientist and Human Rights In India" available at: www.legalservice.com (visited on Jan.17,2008).

⁵⁶ AIR 1971 SC: 1971 CriLJ1298.

*Punjab*⁵⁷ the Apex Court said that the science oriented detection of crime is made a massive programme of police, for in our technological age nothing more primitive can be conceived of than denying the discoveries of the science as aids to crime suppression and nothing cruder can retard forensic efficiency than swearing by traditional oral evidence only, thereby discouraging liberal use of scientific research to prove guilt. In *Kashinath G. Jami v. Speaker*⁵⁸ the court held that the 'evidence provided by the forensic science laboratory was reliable'. In *State of Karnataka v. Bhoja Poojari*⁵⁹, forensic scientist identified the decomposed body of the victim by skull superimposition. That evidence was held to be reliable by the Apex Court. In *Ammini v. State of Kerala*⁶⁰, the Court held that report signed by the Joint Director of the Forensic Laboratory is admissible in evidence. In *State of Rajasthan v. N.K.*⁶¹, a girl of 16 years was raped. One of the evidences on which the prosecution rested its case was the report of the Forensic Science Laboratory, which confirmed the presence of human semen on the lehenga of the prosecution. The court accepted the forensic evidence and decided the case in favour of the prosecution. In *Pawan Kumar v. State of Haryana*⁶², forensic evidence was accepted as reliable for convicting the accused for bride burning. The court has shown favourable attitude towards accepting opinion of the expert in deciding cases.⁶³

7.6 Duties of forensic Scientist

Having established when the service of forensic scientist could be required there are following duties of the forensic scientist:

- Examine material collected or submitted to provide information previously unknown or to corroborate information already available.
- Provide the result of that examination in a report to enable the investigators to trace an offender or to corroborate other evidence to provide a case for presentation to a court.

⁵⁷ AIR 1976 SC 91 "1976 CriLJ 172.

⁵⁸ AIR 1993 SC 1873.

⁵⁹ AIR 1997 SC 3812; 1997 CriLJ 4420.

⁶⁰ AIR 1998 SC 260; 1998 CriLJ 481.

⁶¹ AIR 2000 SC 1812; 2000 CriLJ 2205.

⁶² AIR 2001 SC 1324; 2001 CriLJ 1679.

⁶³ *Supra* 25, 44.

- Present verbal evidence to a court to assist in resolution of the issue as charged.
- It is essential therefore for the scientist to be able to demonstrate competence and integrity by attention to issue such as the following:

The scientist can only give evidence on work carried out personally or under direct supervision. However, an expert witness can interpret factual evidence given by another witness under oath in the light of scientific finding and knowledge.

Where scientific examination are relied on for legal purpose the methods used be based on established scientific principles, validated and preferably, published so they can be scrutinized by the scientific community at large.

Where the scientific findings require interpretation the basis of the interpretation should be available to the scientific community.⁶⁴

7.7 Judicial Approach towards DNA Test, Narco-Analysis Test and Polygraph Test and Its Impact on Human Rights

The approach of the Courts towards DNA testing and its applications in facts finding is very guarded one. The Courts are very cautious in following this test as they think; that it may go against the basic principle of human rights, as the order for such test may interfere with the personal liberty of that person guaranteed under Article 21 of the Constitution⁶⁵, which must be just fair and reasonable one.⁶⁶ The courts also feel that such an order may violate the right of an accused person protected under Art.20 (3) of the Constitution.⁶⁷ However, it is humbly felt that that this is a one sided approach of the Court. Will it not be a violation of human rights in case of a child whose father is denying his acceptance as a biological father? In such a delicate situation which father i.e. whether societal or biological shall have the right as well as the duty towards the child. Will the child not have the right to see that his or her human rights should also be protected and not overlooked by the Courts?

64 Peter White (ed.), *Crime Scene to Court- The Essential of Forensic Science* 9 (RSC Publication, Cambridge, 1998).

65 Art. 21. Says- "No person shall be deprived of his life and personal liberty except according to the procedure established by law".

66 *Maneka Gandhi v. Union of India*. AIR1978 SC597.

67 Art.20 (3) says- "No person accused of any offence shall be compelled to be witness against himself".

The Supreme Court in the famous case of *Gautam Kundu v. State of W.B.*⁶⁸ has held that -

- 1) Courts in India cannot order blood test as a matter of course.
- 2) Whenever applications are made for such prayers in order to have roving inquiry the prayer for blood test cannot be entertained.
- 3) There must be a strong prima facie case in that the husband must establish non-access in order to dispel the presumption arising under Section 112 of the Indian Evidence Act, 1872
- 4) The Court must carefully examine as to what would be the consequence of ordering the blood test. Whether it will have the effect of branding a child as a bastard and the mother as an unchaste woman.
- 5) No one can be compelled to give sample of blood for analysis. From the above opinion of the Hon'ble Supreme Court, it is clear that no person can be compelled for blood test or DNA test, but where there is a prima facie evidence that after a valid marriage if a child is born either during its continuation or within 280 days from the date of dissolution of marriage and the mother remaining unmarried then such fact shall be deemed to be the conclusive proof that the child is the legitimate child of such man.⁶⁹ In such circumstances where any dispute arises regarding parentage of child then the Court can order for blood or DNA test for the proof of paternity. Such an order by the Court under the above circumstances may not be considered as injudicious and can get the cover of just and fair order. However, the above order can be made subject to the absence of any strong assertion based on non-access by the denying father. The above order of the Supreme Court which was made in the parentage related dispute cannot be considered as a binding principle in all different cases related with DNA or blood testing. Thus in a case of rape, where the victim is the sole eye witness accuses the alleged offender, the plea of the accused was that the semen found from the body of the lady cannot be matched with the offender by asking him to go for DNA testing. In such circumstances, taking the pleas of accused person's fundamental right under Art. 20(3) will only lead to the escape

⁶⁸ AIR1993 SC2259.

⁶⁹ Section 112 of the Evidence Act 1872 -Birth during marriage conclusive proof of legitimacy.

of the offender and injustice to the victim. Similarly a rapist father can also deny the parentage of a child conceived through his illegal act and can avoid his incrimination on the ground of absence of any evidence .It is therefore suggested that suitable amendments are required to be brought within the ambit of various laws dealing with the question related with paternity test's.

The above opinion of the Hon'ble Supreme Court has also recently been reflected by the judgment of the Gujarat High Court in *Haribhai Chanabhai Vora v. Keshubhai Haribhai Vora*⁷⁰ where the Hon'ble High Court observed that no one can be compelled to submit himself for DNA test and to compel a person for undergoing a DNA test would amount to interfering with his personal liberty. Some opinion was also made by the A.P. High Court in *Syed Mohd. Ghose*⁷¹ case where the Hon'ble High Court set aside the order of the family Court which had ordered for DNA test and made the following observations that before ordering the blood test, either the DNA or other test the Court has to consider the facts and circumstances of given case and the ramification of such an order. But the Court cannot compel a person to give the sample of blood. From the above judicial opinion it is clear that the Courts are very cautious in ordering for blood or DNA testing in cases of paternity identification test, but it is humbly felt that the above observation of the Courts cannot be applied in cases related with rape, murder or mass murder terrorist related crime investigation cases etc. Such cases deserve to be ordered for mandatory DNA testing by the Courts on the ground of their societal ramification.⁷²

In Case of *Madan Gopal Kakkad v. Naval Dubey*⁷³ the Supreme court held that a medical witness called in as an expert and the evidence given by the medical officer is really an advisory character based on the symptoms found on examination .The expert witnesses is expected to put before the court all material inclusive of the data which induced him to come to the conclusion and enlighten the terms of science so that the court although not an expert ,may form its own judgments on those materials after giving due regard to the expert's opinion because once the expert's opinion is accepted it is not the opinion of the medical officer but that of the court .

70 AIR 2005 Guj 157.

71 2001 CriLJ 2008.

72 Criminal Law Journal 2007, 83-84.

73 (1992)3SCC204at 221-22.

In *Mr. X v. Hospital Z*⁷⁴, the Hon'ble Supreme court was confronted with the task of striking a balance between two conflicting fundamental rights; i.e. the AIDS patient's rights to life which include his right to privacy and confidentiality of his medical condition, and the right of the lady to whom he was engaged to lead a healthy life. The Supreme Court concluded that since the life of the fiancée would be endangered by her marriage and consequent conjugal relation with an AIDS victim, she was entitled to information regarding the medical condition of the man she was about to marry and that there was no infringement of the right to privacy. However, as a corollary to the decision in *Gautam Kundu*⁷⁵ the recent decision of the Supreme Court in the case of *Sharda v. Dharampal*⁷⁶ dealt with the core question of whether a party to a divorce proceeding can be compelled to a medical examination and blood test where the court held that :

- A matrimonial court has the power to order a person to undergo a medical test.
- Passing of such an order by the court would not be in violation of the right to personal liberty or the right to privacy under Art.21 of the Constitution.

It is significant to note that though no person can be compelled to give a sample of blood against him for this refusal, in case of divorce proceeding before a matrimonial court, the court can order an individual to submit himself to medical examination and in case of refusal, can draw an adverse inference from his refusal.

In *Patangi Balarma Ventakata Ganesh v. State of A.P.*, the Andhra Pradesh High Court held that the opinion of DNA expert is admissible in evidence as it is a perfect science. In this case, the DNA expert had deposed as under: "if the DNA fingerprint of a person matches with that of a sample, it means that the sample has come from that person only. The probability of two persons except identical twins having the same DNA fingerprint is around 1 in 30 billion world population". It means that DNA test gives the perfect identity. It is a very advanced science, the court observed.

In *Tbgorani Alias K.Damayanti v. State of Orissa*⁷⁷ the Orissa H.C. noted that the only restriction for issuing a direction to collect the blood sample of the

⁷⁴ AIR1999 SC 495.

⁷⁵ 1993 CriLJ 3233.

⁷⁶ AIR 2003 SC 3450.

⁷⁷ 2004CriLJ4003.

accused for conducting DNA test would be that before passing such a direction, the court should balance the public interest vis-à-vis the rights under article 20(3) and 21 of the Constitution of India in obtaining evidence tending to confirm or disprove that the accused committed the offence concerned. In balancing this interest, consideration of the following matters would be relevant :

- the extent to which the accused may have participated in the commission of the crime ;
- the gravity of the offence and the circumstances in which it is committed ;
- age, physical and mental health of the accused to the extent they are known ;
- whether there is less intrusive and practical way of collecting evidence tending to confirm or disprove the involvement of the accused in the crime ;
- the reason, if any, for the accused for refusing consent.

In *Smt. Kanta Devi v. Poshiram*⁷⁸, the Apex Court held that the result of a genuine DNA test is said to be scientifically true. But even that is not enough to escape from the conclusiveness of Section 112 of the Act, e.g., a husband and wife were living together during the time of conception but DNA test revealed that the child was not of the husband, the conclusiveness in the law would remain un rebuttable. This may look hard from the point of view of the husband who would be compelled to bear the fatherhood of a child of which he may be innocent. It is sublime public policy that children should not suffer social disability on account of the laches or lapses of parents. For this law leans in favour of the innocent child from being bastardized if his mother and father were living together during the time of conception.

The application of Narco-Analysis test involves the fundamental question pertaining to judicial matters and also to Human Rights. The legal position of applying this technique as an investigative aid raises genuine issues like infringement of an individual's rights, liberties and freedom. With crimes going hi-tech and criminals becoming highly trained professionals, the use of Narco-Analysis by the investigating officials can be very useful, because whereas the conscious mind does not speak out the truth, unconscious may reveal the information, which could provide vital lead in.

⁷⁸ AIR 2001 SC 2226.

However, defense lawyers and human rights activists viewed that Narco-Analysis test was a very primitive form of investigation and third degree treatment, and there were legal lapses in interrogation with the aid of drugs.⁷⁹

It is true in Narco-Analysis test, nothing is extracted from the body of the accused, nor is anything compared nor tallied since what is obtained is statement or information given by the accused will be either exculpatory or inculpatory and it is inculpatory statement which is hit by Article 20(3) of the Constitution. Whether the accused make inculpatory or exculpatory statement will be known only after the test is conducted and not before that. So it is premature to say the nature of the statement or information, which the accused give under Narco-Analysis Test.⁸⁰

The right guaranteed under Article 20(3) of the Constitution is in the protection of human rights and dignities, which may need consideration in the light of other equally important provision of the Constitution. Narco-Analysis test severely impact the right against self-incrimination and have the potential to impact the fairness of a trial. There is consensus among the High Courts of the Country that Narco-Analysis may be used as an investigative tool only and not as a source of evidence.

Unfortunately, after the decision given by the Hon'ble Supreme Court in the famous case *Selvi v. State of Karnataka*⁸¹ that Narco-Analysis test cannot be conducted without taking the consent from the accused person otherwise it would be violative to Article 20(3) of the Indian Constitution.

In *Dinesh Dalmia v State*⁸², it was held by the Madras High Court that subjecting an accused to Narco-Analysis is not tantamount to testimony by compulsion. The court supposed about the accused: "he may be taken to the laboratory for such tests against his will, but the revelation during such tests is quite voluntary." In this case the Court observed that where the accused had not allegedly come forward with the truth, the scientific tests are resorted to by the investigation agency. Such a course does not amount to testimonial compulsion. It is amply clear

79 Narco-Analysis test and violation of human rights and Constitutional rights available on <http://www.lawyersclubindia.com/articles/> -(visited on 24-06-2013).

80 Malak Batt, "Loss of justice for sake of convenience? Narco-Analysis and Brain Mapping: An examination in light of Article 20(3)" 115 CrLJ 203(2009).

81 AIR 2010 SC.

82 AIR 2006 SC.

from the above discussion that conducting a Narco-Analysis test does not violate Article 20 (3) of the Constitution per se. Only after conducting the test, if the accused divulges information which is incriminatory, then it will be hit by Article 20(3). Other information divulged during the test can help the investigation. Therefore, there is no reason to make illegal such a test on basis of unconstitutionality.

In 2004, in the multi-crore-rupee fake stamp paper case named *Ranjit Singh Brahamjeet Singh Sharma v. State of Maharashtra and Another*⁸³ it was ruled by the Bombay High Court that conducting the Narco-Analysis test on the accused person does not violate the fundamental right against self-incrimination. Article 20(3) of the Constitution states that: "*No person accused of any offence shall be compelled to be a witness against himself.*" Such statements are not admissible in Narco-Analysis test.

In January 24th, 2008, a bench of Chief Justice K.G. Balakrishnan reserved its ruling after hearing arguments for three days from various parties, including Solicitor General Goolam E. Vahanvati and senior advocate Dushyant Dave, appointed by the bench as amicus curiae to assist the court in the case. Telgi and his accomplices are facing probe by various states' police and other investigative agencies for their alleged criminal acts. These accused people have challenged the legality of the use polygraph, brain mapping and narco-analysis by the investigative agencies to probe the crime.⁸⁴

In the case of *Ramchandra Reddy and Ors. v. State of Maharashtra*⁸⁵, the Bombay High Court upheld the legality of the use of P300 or Brain finger-printing, lie-detector test and the use of Truth Serum or Narco-Analysis. The court upheld a special court order given by the special court in Pune, allowing the SIT (Special Investigation Team) to conduct scientific tests on the accused in the fake stamp paper scam including the main accused, Abdul Karim Telgi. The finding also said that the evidence procured under the effect of truth serum is also admissible. In the course of the judgment, a distinction was drawn between "statement" (made before a police officer) and "testimony" (made under oath in court). The Judges, Justice Palshikar and Justice Kakade, said that the lie-detector and the brain mapping tests did not involve

83 Air 2005 SC 2277.

84 www.supremecourtcases.com (visited on date 02-12-2010).

85 2004 All MR (Cri) 1704.

any “statement” being made and the statement made under Narco-Analysis was not admissible in evidence during the trial. The judgment also held that these tests involve “minimal bodily harm”.

In Kerala a court recently pronounced that no court order is required to do a Narco-Analysis; the magistrate said after disposing of a petition filed by the CBI seeking permission of the court, that filing this type of a plea would only delay the investigation. The court said nobody could stand in the way of the investigating agency conducting tests recognized as effective investigation tools. When the technicalities of the test itself are not clear and uniform, it becomes difficult to accept the stand taken by the court.⁸⁶

In any criminal investigation, interrogation of the suspects and accused plays a vital role in extracting the truth from them. From time immemorial, several methods, most of which were based on some form of torture have been used by the investigating agencies to elicit informations from the accused and the suspects. With the advancement of science and technology, sophisticated methods of lie detection have been developed which do away with the use of “third degree torture” by the police. The scientific tools of interrogation namely- the Lie detector or the Polygraph test, the P300 or the Brain Mapping test and the Narco-Analysis or the Truth Serum test are the main three tests that have recently been developed for extracting confessions. These psychoanalytical tests are also used to interpret the behaviour of the criminal (or the suspect) and corroborate the investigating officers’ observations.⁸⁷ However, such tests generally don’t have legal validity as confessions made by a semi-conscious person are not admissible in court. The court may, however, grant limited admissibility after considering the circumstances under which the test was obtained.⁸⁸

The main provision regarding crime investigation and trial in the Indian Constitution is Art. 20(3). Clause (3) of Article 20 declares that no person accused of an offence shall be compelled to be a witness against himself. This provision may be stated to consist the following three components:

It is a right pertaining to a person accused of an offence

⁸⁶ www.legalserviceindia.com (visited on date 28-02-2012).

⁸⁷ *Ibid.*

⁸⁸ *Supra* 84.

It is a protection against compulsion to be a witness; and

It is a protection against such compulsion resulting in his giving evidence against himself.

The privilege under clause (3) is confined only to an accused i.e. a person against whom a formal accusation relating to the commission of an offence has been leveled which is in the normal course may result in the prosecution. A person against whom a first information report has been recorded by the police and investigation has been ordered by the Magistrate can claim the benefit of the protection. Further, the guarantee in Article 20 (3) is against the compulsion to be 'a witness'. In **State of Bombay v. Kathi Kalu Oghad**⁸⁹, a Bench of the Supreme Court consisting of eleven judges held that: "It is well established that clause (3) of Article 20 is directed against self-incrimination by the accused person. Self-incrimination must mean conveying information based upon personal knowledge of the person giving the information and cannot include merely the mechanical process of producing documents in court which may throw a light on any of the points in the controversy, but which do not contain any statement of the accused based on his personal knowledge." The third component of Article 20 (3) is that it is a prohibition only against the compulsion of the accused to give evidence against himself. In **Kalawati v H.P. State**, the Supreme Court has held that Article 20 (3) does not apply at all to a case where the confession is made by an accused without any inducement, threat or promise.

The privilege against self-incrimination thus enables the maintenance of human privacy and observance of civilized standards in the enforcement of criminal justice. It also goes against the maxim '*Nemo Tenetur se Ipsum Accusare*' that is, 'No man, not even the accused himself can be compelled to answer any question, which may tend to prove him guilty of a crime, he has been accused of.' If the confession from the accused is derived from any physical or moral compulsion (be it under hypnotic state of mind) it should stand to be rejected by the court. The right against forced self-incrimination, widely known as the Right to Silence is enshrined both in the Code of Criminal Procedure (Cr.P.C) and the Indian Constitution. In the Cr.P.C, the legislature has guarded a citizen's right against self-incrimination. Thus Section 161 (2) of the Code of Criminal Procedure states that every person "is bound to

89 AIR 1961SC1808.

answer truthfully all questions, put to him by [a police] officer, other than questions the answers to which would have a tendency to expose that person to a criminal charge, penalty or forfeiture". Arguments have been made that Narco-Analysis constitutes mental torture and thus violates the right to life under Article 21 as it deals with right to privacy. Again, the law against intrusion in privacy of individual would not allow brain fingerprinting evidence to be given in court.

It is well established that the Right to Silence has been granted to the accused by virtue of the pronouncement in the case of *Nandini Sathpathy v. P.L.Dani*⁹⁰ where it was observed that no one can forcibly extract statements from the accused, who has the right to keep silent during the course of interrogation (investigation). She claimed that she had a right of silence by virtue of Article 20(3) of the Constitution and Section 161 (2) of Cr. P.C. The Apex Court upheld her plea.

In the case of *Rojo George v. Deputy Superintendent of Police*,⁹¹ the Court observed while allowing a Narco-Analysis test that at present time the techniques used by the criminals for commission of crime are very tricky and modern. The Conventional method of questioning may not yield any result at all. So the scientific tests like polygraph, brain mapping, Narco-Analysis, etc. are proving very helpful in the investigation of a case. When such tests are conducted under stringent direction of the expert, it cannot be said that there is any violation of the fundamental rights guaranteed to a citizen of India. So it was held by the court that Narco-Analysis test does not amount to the deprivation of personal liberty or intrusion into privacy.

In the case of *M.P. Sharma v. Satish Chandra*⁹², the Apex Court observed that since the words used in Article 20(3) were "to be a witness" and not "to appear as a witness" the protection is extended to compelled evidence obtained outside the Courtroom. In Indian Constitution protection of life, liberty and freedom has throughout interpreted and article 14, 19, 21 are best example for any Constitution against right to privacy. In the Indian Penal Code "injury" is defined in Sections 44, 323, 324, 328 and the punishment for which may extend to 10 years, imprisonment. Hence, administration of narcotic drug amounts to the causing of injury. In Nuremberg Trial when Rudolph Hess, the most notorious war criminal, ever claimed

90 AIR 1978SC1025:1978CriLJ968.

91 2006(2) KLT197.

92 AIR 1954 SC 300.

that he was suffering from amnesia, the prosecutor did not perform Narco-Analysis test on him for there was the possibility of the test to be fatal. Furthermore, the reliability of scientific tests is not free from doubt. It is necessary to recall background of Article 20(3) of the Constitution. For this purpose, it is essential that the Union Government should come out with certain specific guidelines which are to be strictly followed while conducting such a test.

The permission of the Court and the written consent of the person undergoing such a test should be made compulsorily. The person who is supposed to undergo such a test must be given all the necessary details about the test before he is asked to sign the consent form. Control and supervision of the forensic laboratories should be made under the autonomous bodies like NHRC and the States Human Rights Commissions.

NHRC (National Human Rights Commission) has suggested that at the time of polygraph test a forensic psychologist, a psychiatrist and an anesthetist should remain present. Similar team can be directed to remain present at the time of Narco-Analysis with the additional safeguard of entire proceeding audio and videotaped.⁹³

7.8 Conclusion

At present it has been proved that forensic science play an pivotal role. It is very difficult for investigating authorities to solve the crime problems without taking the help from the forensic expert. Really the role of forensic expert is very crucial. When the question is arise before the court that any forensic evidence which is produce before the court is right or not. The court will decide the case with the opinion of the forensic expert on the matter. Because a forensic expert has knowledge in the field of forensic science and he can give his best opinion on the matter relating with the forensic science. There is great role of forensic expert in protection of the rights of the human beings. Forensic expert protect the human rights by given their opinion on the matter. Human rights are those rights which are not alienable and with which a person live with dignity. There are various examples of case laws relating with the forensic evidence in which on the behalf of the opinion given by the forensic expert, the court decide the case and protected the human rights.

93 Narco-Analysis test with special emphasis on Constitution Available at <http://www.lawteacher.net/human-rights/essays/narco-analysis-test-with-emphasis-on-Constitution-law-essays.php#ixzz2uGqjyZ4> (visited on date 10-12-2013).

Chapter VIII

Conclusion and Suggestions

CONCLUSION AND SUGGESTIONS

Forensic science in its broadest sense refers to application of science to law. As our society has grown more complex, it has become more dependent on the rules of law to regulate the knowledge and technology of science and the enforcement of such laws. Each year, as government finds it increasingly necessary to regulate those activities which intimately influence our daily life, science merges more closely with civil and criminal laws. Think for example, the quality of our food, the nature and strength of drugs, the extent of automobile emissions, the kind of fuel oil we burn, the purity of our drinking water and the pesticides we use on our crops and plants. It would be difficult to conceive of any Food and drug regulation or any Environmental Protection Act that could be effectively monitored and enforced without the assistance of scientific technology and the skill of the scientific community. In the arena of criminal justice too, laws are continually being broadened and revised to counter the alarming increase in crime rates. In response to public concern, law enforcement agencies have expanded their tentacles, and investigative function, hoping to stem the rising tide of crime. At the same time they are looking more and more to the scientific community for their sound advice and technical support of their efforts. Can the technology that put astronauts on the moon, split the atom and eradicate the most dreaded diseases be enlisted in this critical battle? Unfortunately, science cannot offer any final and authoritative solution to the problems that stem from social and psychological factors. Science does occupy an important and unique role in the criminal justice system i.e. the role that relates to the scientist's ability to supply accurate and objective informations that reflect the events that have occurred at the time of commission of the crime.

At present, the technology in the hands of criminal is being mayhem. There is great need for law enforcement agencies to take stringent steps against the law breakers. Effective weapons are provided to the enforcement agencies and crime fighters by forensic science. Some of the significant weapons of forensic science are DNA Profiling, Narco-Analysis test, DNA Fingerprinting, Polygraph test, Brain Mapping etc. By the help of these effective scientific techniques, it becomes quite possible to solve the typical criminal problems. Old methods are no more effective in solving the crimes at present time. Earlier, the methods for committing the crimes

were not so much advanced. As a result of which there was no need for applying sophisticated scientific techniques and the old techniques were sufficient in solving the crime problems. But as the society grew major developments took place, the accused person became more and more aware of the use of new scientific techniques in committing the crime. Due to the ineffectiveness of the old techniques, the accused person often took advantage of being innocent at several times.

DNA Profiling, Narco-Analysis Test, Polygraph Test, Brain Mapping and other techniques are proving a great boon for the criminal justice system. With the help of DNA Profiling many civil cases for instance, cases relating with fraud, paternity etc. and criminal cases for instance case relating murder, rape, robbery, dacoity, theft etc are being solved very effectively. In today's technologically developed world, enormous advancements made in the areas of Genetic science and their applications to the legal field is raising lot of positive and negative views from the experts.

Our traditional way of resolving dispute and unraveling the mysteries is basically dependent on the proof of guilt, which can be gathered from different circumstantial or direct evidences. However there are certain civil as well as criminal cases, which in the modern time can be best proved with the help of modern scientific techniques. However, our legal system was framed at a time when such modern scientific techniques neither had developed nor were foresighted. But at present various scientific technologies have revealed that many intricating complicated mysteries related with civil or criminal acts can be easily unraveled with 100 % accuracy in the actual facts and circumstances. But the express inclusions of these scientific tools as a piece of evidence in the legal system are hampering the working of the courts for making an order for such scientific examination on the person concerned.

In case of DNA profiling, a person may be compelled for giving blood sample. By matching of the DNA sample from DNA of the victim, the crime may be successfully detected by the Court. One of the recent examples of such DNA profiling relate to the sensational case of *Rohit Agrawal v. N.D. Tiwari*, in which it was confirmed on the basis DNA profiling that N.D. Tiwari was the biological father of Rohit Agrawal. Other famous cases relating with DNA Profiling are the famous Nithari murder case, Naina Sahni murder case, Madhumita Shukla murder case,

Preeti Jain murder case etc. It has been sufficiently proved in various other cases decided by the Hon'ble courts that DNA Profiling is definitely a helpful technique in the field of forensic science. The various decisions of the courts are also showing that such an order against the wish of the person concerned will be violative of his human rights. On the other hand many developed countries have already introduced the DNA testing technology and its reports as a part of their legal system. The criticism put forward by the legal experts on the ground that the order for DNA testing will violate the fundamental rights of person concerned under Art. 20(3) and 21 does not seem justified. Thus one should not only be concerned with the protection of fundamental right of integrity is questioned, but should also see the right of that person whose rights and liberties the person has been violated, an order for DNA testing can ensure for a speedy and fair justice. So when public interest demands, right to privacy of a person must be subordinate to it, on the ground of reasonableness. However, for safer interest of the person, whose DNA test has been ordered, the report may not be made public unless and until the court think a convincingly to be appropriate, but the report can be used by the courts in its endeavor to find out the real truth and proper justice to the victim.

Other significant branch of forensic science is Narco-analysis test. At present, the importance of 'Narco-Analysis' test is fast increasing and it cannot be denied. It is proving an effective tool in the field of forensic science. It's demand is increasing with the passing of the time. The term Narco-Analysis is becoming very popular in the law enforcement and judicial circle. It is an effective mode of psychotherapy which is an aid to the scientific interrogation in reality. According to Dr. S.L. Vaya, Deputy Director of DFS, Gandhinagar, Gujarat, "Narco-Analysis is a useful and non-invasive asset for investigation of crimes and if used in a scientific way, can be very useful for interrogation of the suspect where the use of third degree methods are quite rampant". For criminal interrogations Narco-analysis has proved to be a valuable technique. Various High Courts have successfully decided the case on the basis of Narco-Analysis test in a catena of cases. There are various famous cases in which the court has allowed the investigative agencies for conducting Narco-Analysis test, for instance sensational Arushi murder case, Nithari case, Ajmal Kasab case, Malegaon Blast case, Badaun rape case, Abdul Karim Stamp case etc. These cases were decided by the court on the basis of Narco-analysis test. These decisions aptly reflect the

effectiveness and importance of the Narco-Analysis test. However, in a recent landmark judgment of **Selvi v. State of Karnataka AIR 2010 SC**, the Supreme Court has held that Narco-analysis test can be conducted on the accused person only after taking the consent of the accused person. If the test is conducted by the investigating agency on the accused person without taking his/her consent, it will be the clear violation of article 20(3) of the Indian Constitution.

Other important branch of forensic science, which the researcher has discussed, is Polygraph test. This test is conducted with the help of polygraph machine to check the blood pressure, pulse rate heart beat etc at the time of questioning. By the help of this test the investigating agencies come to know whether the accused person is lying or not. There are various cases in which the various High Courts have given the order to the investigating authority for conducting the Polygraph test. Recent example of the Polygraph test is Badaun rape case, in which on the basis of Polygraph test, it was made clear by the investigating authorities that the accused persons are not guilty of rape of deceased girl. But after the case of **Selvi v. State of Karnataka**, the position for conducting the test is clear that it can be conducted on the accused person only after taking the consent from the accused person.

It has become absolutely necessary for the State Governments to work with the Central Authorities to enhance the investigative capabilities of their police departments. The Indian Criminal Justice System has an alarmingly low conviction rate and the situation needs to be rectified with more emphasis on real science and state-of-the-art technology. The Central Government must make a clear policy stand on Narco-Analysis test and Polygraph test. The legal system should imbibe growth and progress that occurs in science provided that they do not infringe basic lawful principles and are for the good of the society. DNA Profiling, Narco-Analysis and Polygraph test have proved to be an important techniques for criminal interrogation, which deeply influence both the innocent and the guilty and thus make haste the cause of justice. While the tests may be a practical necessity, the sanction of the law for some of them is difficult to find, and extensive safeguards need to be laid out to prevent their abuse. It is high time for our legislature and judiciary to act immediately for the sake of true justice and fair procedure to bring Narco-Analysis within the scope of Article 20(3) of the Constitution. The manner in which modern-day

criminals make use of science and technology in committing their criminal activities with relative impunity has forced rethinking on the part of the criminal justice establishment to seek the help of the scientific community in order to come to the help of the police, prosecutors and the courts. The criminal procedure, rules of evidence and the institutional infrastructure designed more than a century ago are now proving inadequate to meet the demands of the scientific age. The absence of a national policy in criminal justice administration in this regard is felt to be a serious drawback. The Evidence Act needs to be amended to make the scientific evidence admissible as substantive evidence rather than opinion evidence and establish its probative value, depending on the sophistication of the scientific discipline concerned. It is now an established fact that the use of Narco analysis test without the consent of the accused is unconstitutional.

In the words of Prof. Wicker of the University of Tennessee, "If and when convincing evidence is produced that is reasonably reliable scientific methods of exposing falsehoods either in or out of the court room are available, these methods should be promptly utilized in the legal profession".

Recommended Suggestions:

- Forensic expert must have thorough scientific knowledge of his /her field. He/she should have requisite knowledge and experience regarding the subject before his/her opinion can be acted upon by the courts.
- The role of forensic expert is very crucial. Any wrong , unreasoned or careless opinion may cause great injustice either to the prosecution or to the accused .This means that forensic expert must possess highly ethical and moral character in performing his/her duties sincerely , carefully and diligently .
- A forensic expert should work independently and without bias or pressure as his/ her ultimate goal is that the real truth and justice must prevail.
- Forensic experts must have also the requisite knowledge of the proper law and should be fully acquainted with the Government regulations and orders which are issued from time to time.
- The opinion and statement of the forensic experts must show, without asking or telling, that he/she is an expert in that particular branch of science and must command due respect on the basis of his/her expertise and opinion.

- Concrete steps should be taken to bring forensic science in the forefront of Criminal justice administration. So the presence of Forensic Lab personnel at the time of collection of DNA evidence from the crime scene should be made mandatory under the law.
- Since there is a possibility of delay in collecting DNA samples from the place of occurrence, submission of the same to the laboratories for test or the samples being often tampered with during transfer, evidence should be shown the way to exclude their possibilities from tampering.
- DNA test may be preferably conducted under the order of the Court.
- A network of standardized Forensic Laboratories should be laid down in the country which should be well equipped and must function with proper documentation authorized by the legislation.
- Adequate provisions should be made to make a National Bank DNA Databank, on the basis of CODES maintained by Federal Bureau Investigation in USA. Initially to start with the sample of DNA of prisoners should be collected as their finger impressions are taken and the records are maintained by the Government after their conviction under Identification of Prisoner's Act 1920.
- Every officer should be aware of important issues involved in the identification, collection, transportation and storage of DNA evidence. Given the sensitive nature of DNA evidence, the concerned officers should always contact their laboratory personnel or related technicians when the questions relating to the collection of evidence arise.
- Government should train the investigating agencies in a better way so that they can enhance their investigating skills and resort to the Constitutional measures of investigation, rather than adopting an unconstitutional and inhuman measures.
- Intelligence system must be made more sound and efficient.
- Scientific technique of investigation should not be permitted to the extent they became violative of human rights and constitute torture of the accused.
- Rules laid down by the National Human Rights Commission (NHRC) must be strictly followed while using any scientific technique in Narco-Analysis.

- There must be proper legislations for conducting these tests and there must be proper implementation for enforcing these tests.
- More Polygraph Centers should be opened throughout the Country.
- There should be a Centralised body in India for controlling the procedural standard of tests for proper training of examiners as in USA and Japan.
- The polygraph test must be conducted on the accused person with the help of qualified experts only.
- The court must also allow the investigative authorities to conduct these tests without taking the consent of the accused who are involved particularly in the commission of heinous crimes which are extremely dangerous to the integrity and security of the nation.

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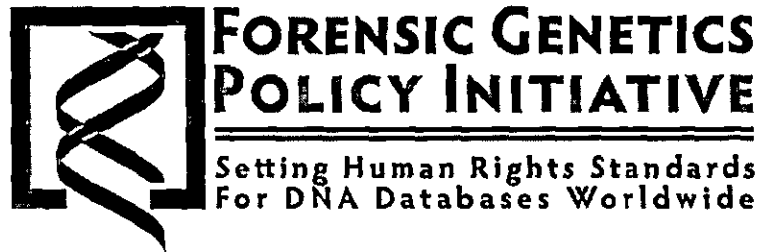
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Annexures



Human DNA Profiling Bill 2012 Analysis

(Working Draft version-29th April 2012)

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Overview: India's updated 2012 Human DNA Profiling Bill offers largely superficial changes from its predecessor, the Draft DNA Profiling Bill 2007. Indeed, where there are significant departures from prior language, they tend to raise additional privacy and human rights concerns. Overall the current version of the Bill is littered with significant and striking human rights and privacy concerns and, if passed in its current form, would place India far outside the mainstream of both law and policy in this area. Beyond the privacy and human rights concerns that are addressed in this analysis of the Bill, the breadth of the structural and financial costs of enacting the Bill in its current form should also be seriously considered as they would most certainly be staggeringly high.

BILL ANALYSIS:

Introduction

The introduction of the Bill sets out the broad policy objectives of its drafters. The most telling portion in paragraph 1 states: "[DNA analysis] makes it possible to determine whether the source of origin of one body substance is identical to that of another, and further to establish the biological relationship, if any, between two individuals, living or dead *without any doubt*." (emphasis added). It is evident that the policy animating the Bill presupposes the objective infallibility of genetic analysis. This patent mistruth underpins the policy rationale for the Bill, and as such casts a long shadow over its substantive provisions. At the very least, it tells the reader (and perhaps one day the court) to broadly interpret the Bill's language to favor DNA analysis as the privileged solution to investigational and prosecutorial needs. This provision, and indeed the bill as a whole, ignores the occurrence of false matches, cross-contamination, laboratory error and other limitations of forensic DNA analysis.

The introduction goes on to state, truthfully, that "DNA analysis offers sensitive information which, if misused can cause harm to person or society." However this statement does not

acknowledge that DNA analysis often causes more harm when used as intended as part of unnecessarily expansive powers given to law enforcement authorities. Indeed this is further illustrated by language showing the legislative intent to draft a broad based bill that would govern the use of DNA in a variety of civil and criminal proceedings as well as for purposes to be determined at a later point.

Definitions (*Chapter II*)

A number of the Bill's definitions are overbroad, further expanding the scope of its later provisions. The "crime scene index" is defined to include "DNA profiles from forensic material found . . . on or within the body of any person, on anything, or at any place, associated with the commission of a specified offence." Chapter II(2)(iv). A "specified offence" is defined as any "offence listed in Part 1 of the Schedule [to the Bill]." Part 1 of the "Schedule," on page 56 of the Bill, includes in (A) "Offences under Indian Penal Code" without any specification. In the 2007 version of the bill, the language related to criminal offences was incredibly expansive but specified the various crimes covered inc. rape, "offences relating to dowry," defamation, and "unnatural offenses." (See 2007 Bill Schedule p. 34). The current Bill version dispenses with such identified crimes and seemingly expands the Schedule to create an "all crimes" database. The new Bill (Section B) further adds a variety of additional offences under special laws ranging from the Medical Termination of Pregnancy Act to the Motor Vehicles Act and empowers the Board to add any new law it wants to the Schedule. Section C of the Schedule identifies a wide variety of civil matters to be included in the Schedule including disputes related to paternity, pedigree, and organ transplantation. It adds additional civil categories not contemplated by prior versions of the Bill including issues related to assisted reproductive technologies, issues related to immigration/emigration and similar to Section B of the Schedule and in another significant departure from previous Bill versions, empowers the Board to include any other civil matter it chooses in the future. The Crime Scene Index also defines victim expansively to include a person "reasonably suspected of being a victim" (Section 2 ii). Taken together, the government is empowered to conduct genetic testing on almost anyone in any way connected with even minor infractions of the criminal law or involved in virtually any civil proceeding.

The definition of "offender" (Section 2y) is not limited to one with a criminal conviction but includes anyone even charged with an offense, thereby expanding coverage of the criminal provisions of the Bill to include individuals who have not yet been convicted of any crime.

The crucial term "suspect" (Section 2zi) is defined as anyone "suspected of having committed an offence." By intentionally leaving out the qualifier "specified," the drafters' intent is plain: to sweep within the Bill's breadth all persons suspected of any crime whatsoever even if there is insufficient probable cause for arrest. And, accordingly, the Bill defines the "suspects index" to include "DNA profiles derived from forensic material lawfully taken from suspects."

Furthermore the definitions include a category of persons entitled "volunteers," (Section 2 zo) defined as "a person who volunteers to undergo a DNA procedure and, in case of a child or incapable person, his parent or guardian having agreed..." There is no additional clarification as to how this category might be treated in practice but without any clear provisions for informed consent, it is highly unlikely that such participation will be truly voluntary; especially without

provisions for decision making subsequent to offering the sample such as future expungement from the system.

Taken together the definitions of victim, offender and suspect expand the reach of this Bill to a broad range of potentially innocent individuals involved in the criminal justice system, while the Schedule and definition of “volunteers” sweep a broad range of categories of innocent citizens into the purview of this Bill- including children and the mentally incapacitated-having nothing to do with the criminal justice system. There is simply no corollary in any other country to such expansive authority. The Bill places India far outside the mainstream of policy in this area and raises serious and far ranging human rights concerns

DNA Profiling Board (Chapter III)

The DNA Profiling Board (hereinafter “Board”) is responsible for administering and overseeing the Indian DNA database . Oversight is an important and valuable concept, however the value of such principles in this Bill are completely overshadowed by the expansive powers given to the Board.

The Bill lays out a number of fields from which the members are to be chosen inc. molecular biology, population biology, criminal justice and bioethics. There is no representation from civil society human rights organizations or the criminal defense bar to ensure that privacy, human rights and the general public interest are ensured. Furthermore the Chief Executive Officer of the Board is to be a scientist and therefore unlikely to be familiar with criminal justice matters and evaluations of their efficacy. (Chapter III, Section 10)

The Board is given an almost limitless list of responsibilities including “recommendations for maximizing the use of DNA techniques and technologies (Section 10k) and identifying scientific advances that may assist law enforcement (Section 10L). Such powers are particularly concerning because the Bill does not include any privacy provisions whatsoever but rather invests in the Board the power to make “recommendations for privacy protection laws, regulations and practices relating to access to, or use of stored DNA samples or DNA analyses,” as well as “mak[ing] specific recommendations to . . . ensure the appropriate use and dissemination of DNA information [and] take any other necessary steps required to be taken to protect privacy.” (Section 10o and p). Furthermore the Board is given the responsibility of “deliberating and advising on all ethical and human rights issues emanating out of DNA profiling.” (Section 10t).

These provisions are in lieu of any substantive language limiting the scope of the legislation, and protecting privacy and human rights principles (which the bill otherwise lacks.) These are significant omissions. As expressed in the introduction, the stated purpose of the Bill is “to enhance protection of people in the society and [the] administration of justice.” Taken alone, this Bill actually expresses only the government’s interest in the legislation, suggesting an ambiguously wide scope for its provisions. Substantive concepts of individual privacy and human rights are required to counterbalance the interests of the government and provide

protections for the equally vital privacy and human rights interests of the individual. As such, limiting privacy and human rights principles should be included alongside the expression of the government's security interest. Without it, the Board will effectively have *carte blanche* with regard to what privacy and human rights protections are—or are not—adopted.

Also in a departure from previous versions of this Bill, this Bill expands the Board's powers to include areas of policy beyond the coverage of the Bill's other provisions including "intellectual property issues. (Section 10i)

Finally, as noted earlier in the discussion of the Schedule (and in a significant departure from previous versions of the Bill), the Board is given total control to expand every category of person to be included under the Bill. In a democratic system of government, such decisions should rest exclusively with the Parliament and therefore be subject to the checks and balances of government as well as the transparency necessary to ensure public participation. Leaving such decision making to an unelected body raises serious human rights concerns.

Approval of Laboratories (*Chapter IV*)

Sections 13 to 17 provide for the approval by the DNA Profiling Board of DNA laboratories that will process and analyze genetic material for eventual inclusion on the DNA database. Under Section 13, all laboratories must be approved in writing prior to processing or analyzing any genetic material. However, a conflicting provision appears in the next section, Section 14(2), which permits DNA laboratories in existence at the time the legislation is enacted to process or analyze DNA samples immediately, without first obtaining approval.

Either an oversight on the part of the drafters, or the product of overly-vague language, the result is that established genetic laboratories—including whatever genetic material or profiles they may already have for whatever reason—are in effect "grandfathered" into the system. The only review of these laboratories is the *post hoc* approval of the laboratory by the DNA profiling board. The potential for abuse and error that this conflict of provisions would be best addressed in keeping with the rule articulated in Section 13, i.e. correcting the language of Section 14(2) that allows for laboratories to be "grandfathered" into the system.

Standards, Obligations of DNA Laboratory (*Chapter V*)

Chapter V, which concerns the obligations of and the standards to be observed by approved DNA laboratories, lacks adequate administrative requirements. For example, Section 21 requires that labs ensure "adequate security" to minimize contamination without providing for accountability in the event of contamination. Similarly, Section 27 provides for audits of DNA laboratories only, withholding from similar scrutiny of the DNA Profiling Board itself. However, the greatest limitation of every Section of this Chapter is that rather than offering any specific substantive requirements, they instead offer categories requiring attention "as may be specified "

by the DNA Board. Any actual standard or obligation by a laboratory is set entirely by the DNA Board. Minimum standards must be set by law to ensure compliance.

Infrastructure and Training (*Chapter VI*)

Similar to Chapter V, this section offers no legislative benchmarks but rather categories of activities, with further regulation “as may be specified” by the Board. As noted earlier, there are serious concerns in using DNA analysis with regards to false matches, cross-contamination and laboratory error. Not taking such concerns seriously, and taking serious steps to minimize their occurrence, can lead to significant distrust of government and police authority when such incidents occur.

DNA Databank (*Chapter VII*)

In addition on one national DNA database, the Bill sanctions the several Indian states to maintain their own DNA databases, provided these state-level databases forward copies of their content to the national database. Section 32(3). Section 32(5) states that the indices should include records related thereto” the DNA analysis. (See also Section 35(b)) Such provisions allow for access to “the information” contained in the database, not simply “the DNA profiles” contained in the database. Without further clarification it would appear to authorize an unlimited amount of private information unrelated to identification to be included in the indices.

The national database is envisioned to comprise several sub-databases (Section 32(4)), each to contain the genetic information of a subset of persons/samples, namely: (a) unidentified crime scene samples, (b) samples taken from suspects, (c) samples taken from offenders inc. persons convicted or currently subject to prosecution for criminal offenses (d) samples associated with missing persons, (e) samples taken from unidentified bodies, (f) samples taken from “volunteers,” and finally (g) samples taken for reasons “as may be specified by regulations made by the Board. Section 33 (4) *et seq.* Putting to one side the breadth of persons subject to inclusion under subcategories (1) through (6), subsection (7) appears on its face to be a “catch all” provision, leaving one only to guess at the circumstances under which its specificities may be promulgated.

A close reading of Section 32(6) strongly suggests that the agency conducting the forensic analyses and populating the DNA database shall retain the actual DNA samples thereafter. This section reads in relevant part:

The “DNA Data Bank shall contain . . . the following information, namely: (a) in case of a profile in the offenders index, the identity of the person from whose body substance or body substances the profile was derived, and (b) in case of all other profiles, the case reference number of the investigation associated with the body substance or body substances from which the profile was derived.

Allowing retention of the biological sample, even after a profile has been created from it, in conjunction with the unlimited ability of the Board to create regulations for additional uses of that sample raises serious privacy and human rights concerns.

Moreover, rather than choosing to link the DNA profile data to a specific offender or case, the drafters of the Bill instead link the “body substance or body substances” with that specific offender or case. Whether sloppy drafting or clever nuance, this provision equates the DNA *profile* with the DNA *sample*, injecting unneeded—and potentially harmful—ambiguity into the proposed law.

Section 37 (1) allows for indefinite retention of information in the offenders index (which includes individuals charged with an offense but not convicted). This provision raises serious human rights concerns as it would appear to allow indefinite retention of profiles of individuals who have not been convicted of a crime. This directly conflicts with Section 37 (II) which allows for expungement when a certified copy of a court order stating that the individual in question has been acquitted. This provision also appears to conflict with Chapter VIII Section 43(b) which appears to allow indefinite retention of DNA of suspects even after they’ve been excluded from an investigation. Indeed no process or procedures for expungement and removal of records are in place for suspects generally who are never charged or for any of the other categories of indices that are present in the Bill, thereby raising serious question as to how and even whether such profiles can be removed from the Databank.

Confidentiality, Access to DNA Profiles, Samples, and Records (*Chapter VIII*)

Two further provisions regarding access to the database warrant close scrutiny. First, Sections 39 and 40 confers upon the Board the unlimited power to expand categories for which DNA profiles, samples and records can be used. Considering that the Bill (Section 40(e)) already questionably allows such records to be used for population research, these provisions raise serious questions as to the classes of potential use such private information might be subject.

Sections 40–42 purport to confer upon the police and other authorized individuals direct access to all of the information contained in the national DNA database. While administratively expedient, this arrangement opens up the possibility for misuse. A more prudent system would place the Board (or some administrative subordinate portion thereof) between the police and the content of the DNA database, with the latter having to make specific and particular requests to the former. This would minimize the risks inherent in the more expansive model of database access the bill currently envisions.

Section 45 related to post-conviction DNA testing has the laudable goal of offering “any individual undergoing a sentence of imprisonment or death pursuant to conviction for an offence, may apply to the court which convicted him for an order of DNA testing” in order to prove their innocence. However such an application lists eleven separate criteria that such an applicant must meet before qualifying, and allows a court total discretion in deciding whether all such criteria have been met. High barriers and absolute discretion make such testing highly unlikely and therefore make a provision seeming to offer human rights protections completely hollow.

Offences and Penalties (Chapter X)

This chapter lays out penalties for misuse of the Database. Most notably, the bill specifically excludes a private cause of action for the unlawful collection of DNA, or for the unlawful storage of private information on the national DNA database. A new provision in Section 58 does allow for an aggrieved person to petition the Central Government or Board if an instance of misuse is not being addressed but such provision does not contain any required processes such entities must follow in responding to such a petition, making an otherwise positive new provision relatively empty. Nor does the bill grant an individual right to review one's personal data contained on the database. Without these key features, there are limited checks against the unlawful collection, analysis, and storage of private genetic information on the database.

BEST PRACTICES ANALYSIS

Collection of DNA

With consent: only for a specific investigation (e.g. from a victim or for elimination purposes). Volunteers should not have information entered on a database	No provision
Without consent: only from persons suspected of a crime for which DNA evidence is directly relevant i.e. a crime scene sample exists or is likely to exist. Or, broader categories?	No provision
Requirement for an order by a court? Or allowed in other circumstances?	No provision
Samples collected by police officers, or only medical professionals? Must take place in a secure location i.e. not on the street etc.	No provision
Provision of information for all persons from whom DNA is taken	No provision
Crime scenes should be promptly examined if DNA evidence is likely to be relevant, and quality assurance procedures must protect against contamination of evidence	No provision; regulated at discretion of DNA Profiling Board

Analysis of DNA

Should take place only in laboratories with quality assurance	Regulated at discretion of DNA Profiling Board
Laboratories should be independent of police	No provision; regulated at discretion of DNA Profiling Board
Profiling standards must be sufficient to minimize false matches occurring by chance. This must take account of increased likelihood of false matches in transboundary searches, and with relatives.	No provision; regulated at discretion of DNA Profiling Board

Storage of DNA and linked data

Data from convicted persons should be separate from others e.g. missing persons' databases	Unclear.
Access to databases and samples must be restricted and there must be an independent and transparent system of governance, with regular information published e.g. annual reports, minutes of oversight meetings	Access to database at discretion of DNA Data Bank Manager
Personal identification information should not be sent with samples to laboratories	No provision; regulated at discretion of DNA Profiling Board
Any transfer of data e.g. from police station to lab or database, must be secure	No provision; regulated at discretion of DNA Profiling Board

Uses of samples and data

Research uses should be restricted to anonymised verification of database performance (e.g. checking false matches etc.). Third party access to data for such purposes should be allowed, provided public information on research projects is published. There should be an ethics board.	No provision
Research uses for other purposes e.g. health research, behavioral research should not be allowed.	No provision
Uses should be restricted by law to solving crimes or identifying dead	Ambiguous

bodies/body parts. Identification of a person is not an acceptable use. Missing persons databases (if they exist) should be separate from police databases	provisions suggest much wider scope
Familial searching should be restricted e.g. ordered by a court? Or not used? Or regulated for use in special cases?	No provision

Destruction of DNA and linked data

DNA samples should be destroyed once the DNA profiles needed for identification purposes have been obtained from them, allowing for sufficient time for quality assurance, e.g. six months	DNA samples are retained
An automatic removals process is required for deletion of data from innocent persons. This must take place within a reasonable time of acquittal etc.	No provision
There should be limits on retention of DNA profiles from persons convicted of minor crimes	No provision
There should be an appeals process against retention of data	No provision
Linked data on other databases (e.g. police record of arrest, fingerprints) should be deleted at the same time as DNA database records	No provision
Crime scene DNA evidence should be retained for as long as a reinvestigation might be needed (including to address miscarriages of justice)	DNA evidence permitted to be retained indefinitely

Use in court

Individuals must have a right to have a second sample taken from them and reanalyzed as a check	No provision
Individuals must have a right to obtain re-analysis of crime scene forensic evidence in the event of appeal	Allowed but with impossibly high barriers
Expert evidence and statistics must not misrepresent the role and value of the DNA evidence in relation to the crime	No provision

Other

Relevant safeguards must be proscribed by law and there should be appropriate penalties for abuse	No provision
Impacts on children and other vulnerable persons (e.g. mentally ill) must be considered	No provision
Potential for racial bias must be minimized	No provision